3. SITE AND CONTAMINANT SCREENING

The preliminary step in this Waste Area Group (WAG) 9 Comprehensive Remedial Investigation/Baseline Risk Assessment (RI/BRA) was an evaluation of all available data and information compiled for previous investigations for each of the WAG 9 sites. This evaluation is presented in the screening and data gap analysis (SDGA) Section 2 of *the Work Plan for Operable Unit 9-04 Comprehensive RI/FS* (Lee et al. 1995). Since then, additional samples have been collected during the WAG 9 field season and the data sets have been further subdivided into smaller more manageable data sets. The OU 9-04 sties that have been subdivided into more manageable data sets are the ANL-01, ANL-09, and ANL-53. Site ANL-01 (Industrial Waste Pond and Three Ditches) was separated into four individual units: the Industrial Waste Pond, Ditch A, Ditch B, and Ditch C. The CERCLA site ANL-09 (Interceptor Canal) was separated into two units; the Interceptor Canal Ditch and the Interceptor Canal mound. ANL-W site ANL-53 (Main Cooling Tower Risers Pits) was separated into three units: the four riser pits and the north and south discharge areas. This was done to facilitate calculation of the risks in each of these ditches separately since they have distinct physical characteristics for exposure pathways and spatially separated boundaries.

This section of the SDGA presents the site screening methodology and results, a summary of all release sites within WAG 9, the contaminant screening methodology and results, and a summary of potential data gaps. Sites within WAG 9 were screened using the site and contaminant screening methodologies presented in *Guidance Protocol of Cumulative Risk Assessments at the INEL* (INEL 1995). Figure 3-1 illustrates the site and contaminant screening methodology.

3.1 Site Screening

In the site screening, two primary criteria for retaining a site are (a) if a COPC exists for a site, or (b) if a data gap on a site exists. The steps to complete the site screening are presented below:

1. Compile information for WAG 9 sites

2. Identify newly identified and unevaluated sites

3. Eliminate No Action sites and sites for which a source does not exist

4. Eliminate sites for which no contamination was detected or the risk was determined to be less than 1E-06 and the hazard quotient less than 1 as a result of previous risk evaluation activities (e.g., Track 1, Track 2, or other investigations), if less than 10 sites are eliminated by this step. As described in and agreed upon by regulators (EPA and IDHW) in the OU 9-04 Comprehensive RI/FS Work Plan.

5. Retain sites containing known contamination for further evaluation against the contaminant screening criteria.

In Step 4, if greater than 10 sites are eliminated using this step, then the risk screening level is 1E-07 and the screening hazard quotient is 0.1.

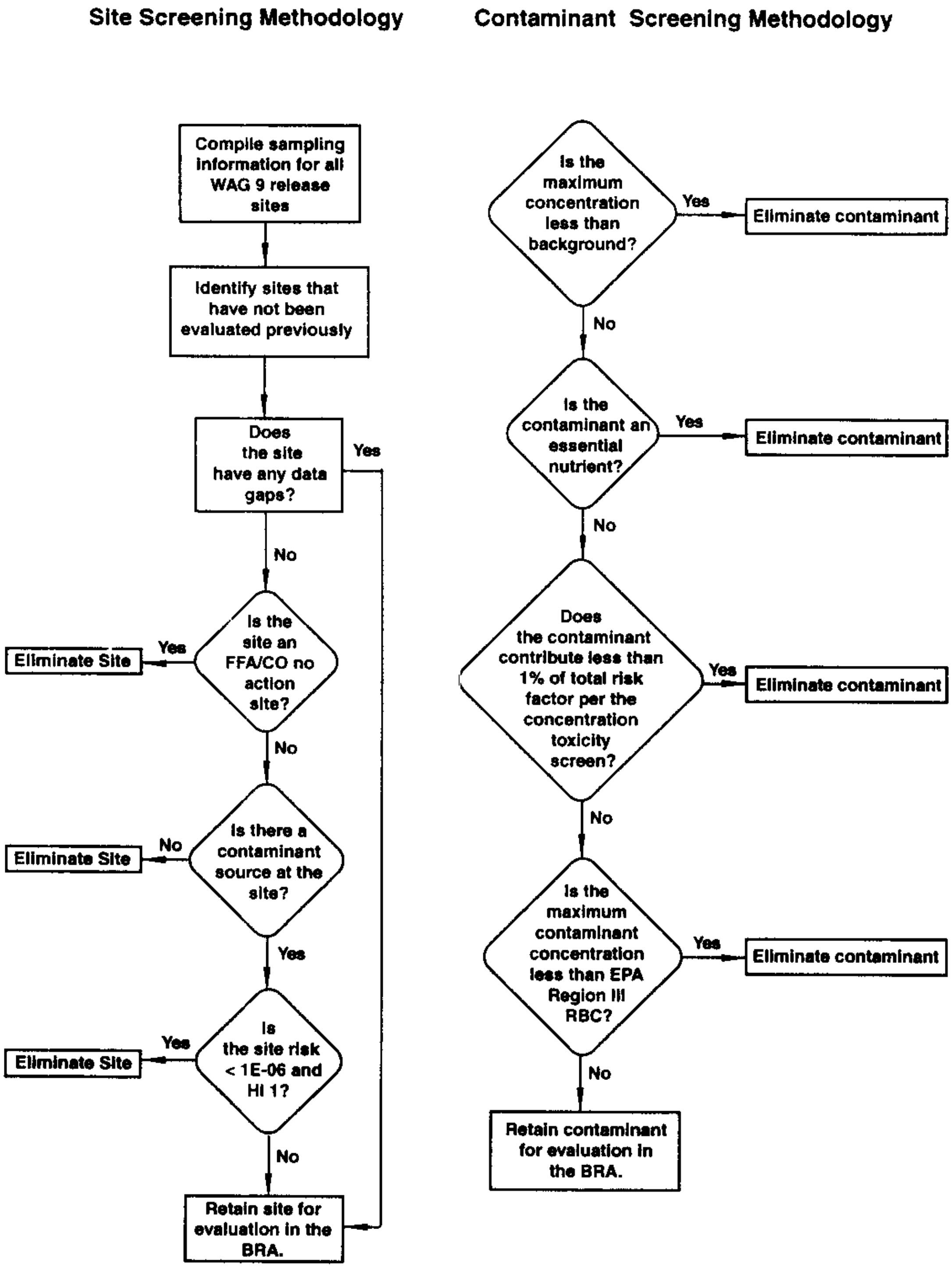

Figure 3-1. Site and contaminant screening methodologies.

3.1.1 Step 1--Compile Information for WAG 9

In the Federal Facility Agreement and Consent Order (FFA/CO 1991), WAG 9 is divided into four OUs. These OUs are further divided by release sites, and are identified by site code in the FFA/CO.

Figure 3-2 shows location, site code, and surface area of the WAG 9 release sites. There are 37 release sites, which include the Industrial Waste Pond and three Ditches, the Main Cooling Tower Blowdown Ditch, the Industrial Waste Liftstation Discharge Ditch, the EBR-II Leach Pit, the Interceptor Canal, and other miscellaneous disposal systems that may have received accidental releases of hazardous substances. Information and data for these sites provided the input for the site screening and data gap analysis. Table 3-1 summarizes release site descriptions, COPCs, data available, known or potential data gaps, and references. Data gaps, which could preclude the completion of the 9-04 RI/FS, are identified in the following operable unit summaries, as appropriate. Available data for the release sites that are retained for evaluation in the risk assessment are presented in Appendix A. Because data quality, as presented in a precision, accuracy, representativeness, and completeness section, was presented in the individual site assessment reports (e.g., Track 2 Summary Report), no further presentation of data quality is presented herein.

3.1.1.1 OU 9-01. This OU consists of the following 10 miscellaneous sites.

3.1.1.1.1 Sanitary Sewage Lagoons (ANL-04)—The sanitary sewage lagoons are located at the Sanitary Sewage Treatment Facility, north of the ANL-W facility. Two lagoons were constructed in 1965 along with a third built later in 1974. According to engineering drawings, the three sanitary sewage lagoons cover approximately two acres. As shown in Figure 1-1 located at the beginning of this document, the lagoons' approximate dimensions are (1) 46 × 46 × 2.1 m (150 × 150 × 7 ft), (2) 15 × 30 × 2.1 m (50 × 100 × 7 ft), and (3) 38 × 122 × 2 1 m (125 × 400 × 7 ft). The lagoons receive all sanitary wastes originating at ANL-W, with the exception of the Transient Reactor Test Facility, Sodium Process Facility, and the Sodium Components Maintenance Shop. Sanitary waste discharged is from rest rooms change facilities, drinking fountains, and the Cafeteria. The three lagoons are sealed with a 0.32 to 0.63-cm (0.125 to 0.25-in.) bottom bentonite liner and are situated approximately 183 m (600 ft) above the groundwater.

A large leak in the northeast corner of the third lagoon was detected after its construction in 1974. This leak resulted in the loss of over a million gallons of waste water through fissures that were not sealed completely by the bentonite. This was rectified by using a 30-mil hypalon liner over the northeast corner and sealing the seams. A study in 1992 (Braun 1992) confirmed that the Sanitary Lagoons are functioning as evaporative ponds and not as percolating ponds, suggesting that the bentonite and hypalon liner has remained intact.

Between 1975 and 1981, photo processing solutions were discharged from the Fuel Assembly and Storage Building to the Sanitary Waste Lift Station, which discharges to the lagoons. The manager of Fuel Assembly and Storage Building during that period estimates that approximately 1.32 Troy ounces of silver were discharged to the Sanitary Waste Lift Station. It has not been confirmed whether the silver was released to the sanitary lagoons or if it remained in the lift station. However, risk-based calculations show that the estimated silver concentration (68 mg/kg) for the given amount (1.32 Troy oz.) is well below that required to exceed a risk greater than 1×10^{-6} (327 mg/kg). Furthermore, photo processing was discontinued at the Fuel Assembly and Storage Building in 1981; subsequently, there has been no further releases to the lift station, or subsequently the sewage lagoons. With the exception of an occasional point source of low level medical radionuclides, there has been no known radioactive hazardous substances

Table 3-1. Summary of data available for potential release sites within ANL-W (WAG 9).

OU	Site	Site description	COPCs	Data available	Potential or known data gaps	Source of information
None	ANL-10	Dry Well between T-1 and ZPPR Mound	None	Interviews with facility personnel indicate that the dry well was hooked up to a septic tank which was removed in 1966. Therefore, no source exists.	None	Initial Assessment Report for ANL-W (1986).
None	ANL-11	Waste Retention Tank 783	None	Interviews of former facility operators indicate that no hazardous constituents were ever disposed at the tank; Therefore, no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-12	Suspect Waste Retention Tank by 793	None	Interviews of former facility operators indicate that the tank was removed in 1979 and that no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-14	Septic Tank and Drain Fields (2) by 753	None	Process knowledge and interviews with plant services personnel indicate that the only materials disposed were trace quantities of cleaning supplies. The tank was removed in 1979 and no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-15	Dry Well by 768	None	Process knowledge and interviews with facility personnel indicate that the only hazardous constituent disposed was hydrazine.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-16	Dry Well by 759 (2)	None	Process knowledge and interviews with facility personnel indicate that the only hazardous constituent disposed was hydrazine.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).

OU	Site	Site description	COPCs	Data available	Potential or known data gaps	Source of information
None	ANL-17	Dry Well by 720	None	Process knowledge and interviews with facility personnel, no hazardous constituents were ever disposed and therefore no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-18	Septic Tank and Drain Field by 789	None	The septic tank and drain field were removed in 1979. Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site.	None	Initial Assessment Report for ANL-W (1986).
None	ANL-20	Septic Tank and Drain Field by 793	None	Engineering drawings, and interviews with employees indicate no hazardous constituents were disposed and therefore no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-21	TREAT Suspect Waste Tank and Leaching Field (Non-radioactive)	None	Process knowledge and interviews with plant services personnel indicate that the only materials disposed were trace quantities of cleaning supplies, therefore, no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-22	TREAT Septic Tank and the current Leaching Field	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site; therefore, no source exists.	None	Initial Assessment Report for ANL-W (1986).
None	ANL-23	TREAT Seepage Pit and Septic Tank West of 720	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site. The tank was filled with sand in 1980; therefore, no source exists.	None	Initial Assessment Report for ANL-W (1986).

OU	Site	Site description	COPCs	Data available	Potential or known data gaps	Source of information
None	ANL-24	Lab and Office Acid Neutralization Tank	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site. Therefore, no source exists.	None	Initial Assessment Report for ANL-W (1986).
None	ANL-25	Interior Building Coffin Neutralization Tank	None	After neutralization with sodium hydroxide, the liquid was transferred to the retention tank. Thus, no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-26	Critical Systems Maintenance Degreasing Unit	None	The degreasing unit is self-contained and is inside another building. No evidence exists (from spill records and interviews) of any hazardous constituents being spilled. All wastes are collected by a commercial vendor, therefore no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-27	Plant Services Degreasing Unit	None	The degreasing unit is self-contained and is inside another building. No evidence exists (from spill records and interviews) of any hazardous constituents being spilled. All wastes are collected by a commercial vendor; therefore no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
None	ANL-32	TREAT Control Building 721 Septic Tank and Leach Field (Present)	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site; therefore, no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).

OU	Site	Site description	COPCs	Data available	Potential or known data gaps	Source of information
None	ANL-33	TREAT Control Building 721 Septic Tank and Seepage Pit	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site. The tank was removed in 1978 and no source exists.	None	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a).
9-01	ANL-04	ANL Sewage Lagoons	Metals and radionuclides	Sludge samples were collected in 1994 and analyzed for metals and radionuclides.	No	Track 1 Decision Documentation Package (ANL-W 1995a) identified further evaluation of 1 million gallon water loss. This was evaluated in the OU 9-04 RI/FS Work Plan. The data is also summarized in Section 3.1.1.1 of this OU 9-04 RI/FS report.
9-01	ANL-19	Sludge Pit West of T-7 (Imhoff Tank)	None	Engineering drawings indicate that industrial wastes and laboratory process wastes were discharged to a separate waste piping system. The tank was filled with dirt in 1978. Therefore no source exists.	None	Track 1 Decision Documentation Package (RUST Geotech 1994a).
9-01	ANL-28	EBR-II Sump	Sulfuric acid and hexavalent chromium	Based on water chemistry results, the hexavalent chromium was reduced to trivalent chromium and the pH of the liquid discharged typically ranged between 4-11.	None	Track 1 Decision Documentation Package (RUST Geotech 1994b).
9-01	ANL-29	Industrial Waste Lift Station	Silver	Sludge samples were collected in 1986, 1990, and 1995 and analyzed for silver.	None	Track 1 Decision Documentation Package (ANL-W 1995b).
9-01	ANL-30	Sanitary Waste Lift Station	Silver	Process knowledge, review of historical records, and drawings indicate there was a release of silver to the site.	None	Track 1 Decision Documentation Package (ANL-W 1994a).
9-01	ANL-36	TREAT Photo Processing Discharge Ditch	Silver	Soil samples were collected in 1987 and analyzed for silver.	None	Track 1 Decision Documentation Package (RUST Geotech 1994c).

OU	Site	Site description	COPCs	Data available	Potential or known data gaps	Source of information
9-01	ANL-60	Knawa Butte Debris Pile	None	Process knowledge of where the soil and debris was moved from indicate there is no source at the site.	None	Track 1 Decision Documentation Package (ANL-W 1994b).
9-01	ANL-61	EBR-II Transformer Yard	PCBs	Analytical results from the soil at this site during removal of the transformers.	None	Track 1 Decision Documentation Package (RUST Geotech 1994d).
9-01	ANL-61A	PCB-contaminated soil adjacent to ANL-61	PCBs	Analytical results from the soil at this site during removal of the transformers.	Yes	Track 1 Decision Documentation Package for ANL-61 (RUST Geotech 1994d).
9-01	ANL-62	Sodium Boiler Building (766) Hotwell	None	Process knowledge and interviews with facility personnel indicate that the only hazardous constituents disposed we·. hydrazine and tritium.	None	Track 1 Decision Documentation Package (ANL-W 1994c).
9-01	ANL-63	Septic Tank 789-A	None	Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site. Therefore no source exists.	None	Track 1 Decision Documentation Package (RUST Geotech 1994e).
9-02	ANL-08	EBR-II Leach Pit (Radioactive)	Radionuclides, metals, dioxins, and semivolatile organic compounds	Analytical results from sludge soil and basalt and groundwater samples collected in 1991 and 1993.	Yes	9-02 Track 2 Summary Report (RUST Geotech 1994b).
9-03	ANL-05	ANL Open Burn Pits #1, #2, and #3	Metals, radionuclides, VOCs, PAHs, and dioxins/furans	Site inspections, historical records, and analytical results from soil samples collected in 1988 and 1994.	None	Revised 9-03 Track 2 Summary Report (ANL-W 1995c).
9-03	ANL-31	Industrial/Sanitary Waste Lift Station (Industrial Side Not Used)	Metals and radionuclides	Historical operational knowledge and analytical results of the sampling conducted in 1995.	None	Revised 9-03 Track 2 Summary Report (ANL-W 1995c).

OU	Site	Site description	COPCs	Data available	Potential or known data gaps	Source of information
9-03	ANL-34	Fuel Oil Spill by Building 755	Fuel Oil (benzene/ naphthalene)	Modeling results based on the estimated volume of the fuel oil spill.	None	Revised 9-03 Track 2 Summary Report (ANL-W 1995c).
9-04	ANL-01	Industrial Waste Pond and Cooling Tower Blowdown Ditches (3)	Metals, radionuclides, VOCs, and herbicides	Analytical results from soil, sludge, and water samples at the IWP collected in 1986, 1987, 1988 and 1994 and analytical results from soil samples collected at the ditches in 1988 and 1994.	Yes	Revised Preliminary Scoping Package (ANL-W 1995d).
9-04	ANL-01A	Main Cooling Tower Blowdown Ditch	Metals, radionuclides, and semivolatile organic compounds	Analytical results from soil samples collected in 1987, 1988 and 1994.	Yes	Revised Preliminary Scoping Package (ANL-W 1995e).
9-04	ANL-09	ANL Interceptor Canal	Metals and radionuclides	Analytical results from soil samples collected in 1994.	None	Revised Preliminary Scoping Package (ANL-W 1995f).
9-04	ANL-35	Industrial Waste Lift Station Discharge Ditch	Metals, radionuclides, VOCs, and dioxin/furans	Analytical results from soil samples were collected in 1988 and 1994 and analytical results from water samples collected in 1988.	None	Revised Preliminary Scoping Package (ANL-W 1995g).
9-04	ANL-53	Cooling Tower Riser Pits	Metals	Analytical results from soil samples collected in 1989.	None	Preliminary Scoping Package (ANL-W 1993).
10-06*	-	ANL-W Windblown Soil	Radionuclides	Analytical results from RESL 1993	None	RI/FS for 10-06 (LMIT 1995)
10-06*	-	ANL-W Stockpile	Radionuclides	48 Soil Samples in 1994	None	RI/FS for 10-06 (LMIT 1995)

* These OU 10-06 sites have been added for inclusion in the 9-04 RI/FS for information only.

Figure 3-2. ANL-W release sites.

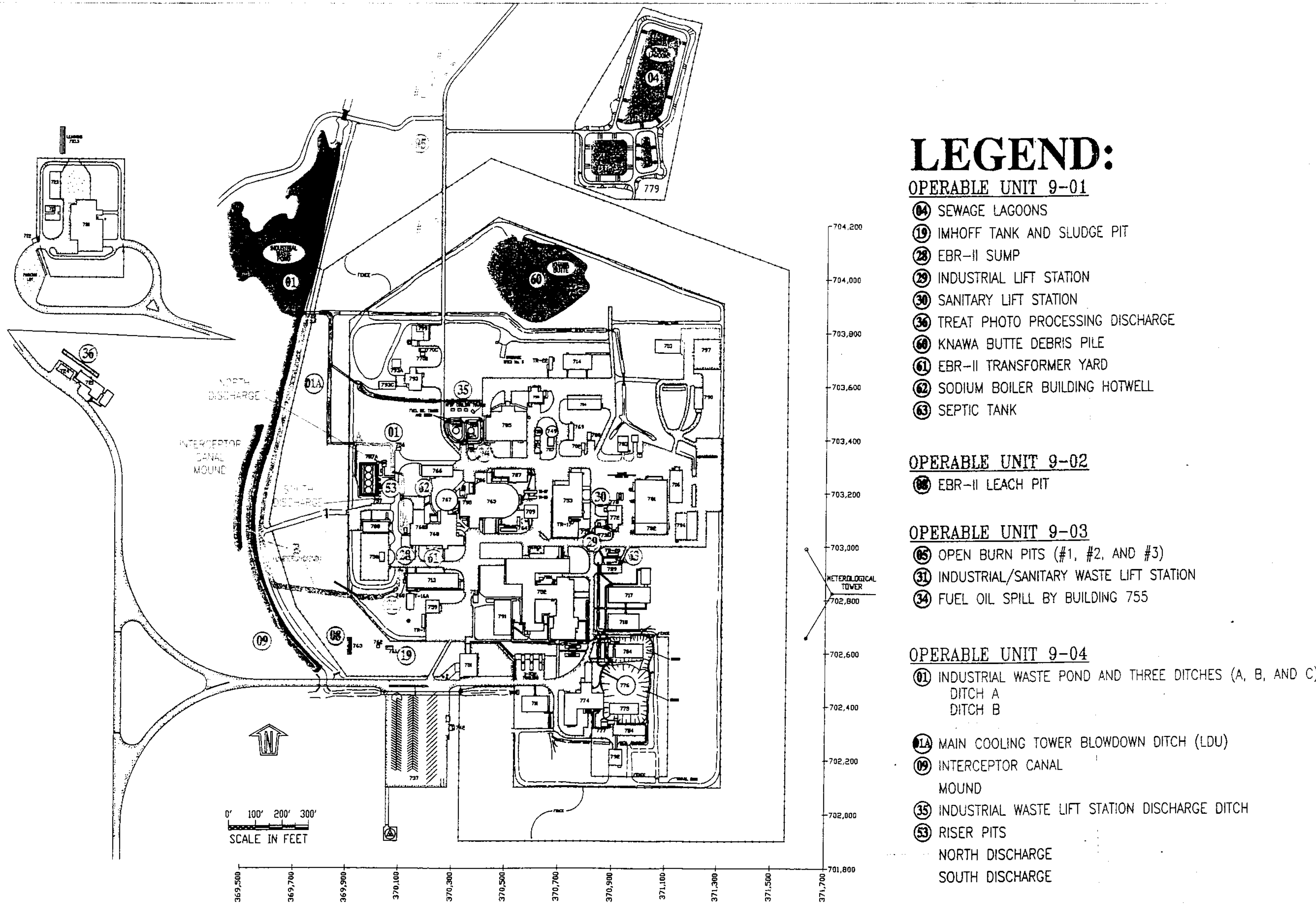

Figure 3-2 LOCATION AND SITE CODES OF WAG 9 RELEASE SITES

MAY 28, 1997/ESWM
SITE-087.DWG (SITE-24)

released into the Sewage Lagoons. Periodic sampling of the Sewage Lagoon and a radionuclide detector placed in the lift station (Sanitary Waste Lift Station-788) supplying the Sewage Lagoons support these conclusions. However, because no prior sludge samples were analyzed for metals and radionuclides, seven sludge samples were collected in 1994. The results from this sampling were used in a Track 1 risk evaluation in 1995 (ANL-W 1995a), which indicates that the maximum concentrations of arsenic and chromium (i.e., 10.4 mg/kg and 76.4 mg/kg, respectively) exceed risk-based soil concentrations (i.e., 0.366 mg/kg and 24.9 mg/kg, respectively). The arsenic and chromium were screened from COCs after the ANL-W sludge concentrations were compared to typical sewage sludge concentrations. This assumes that all the chromium is hexavalent chromium.

A data gap was identified by the EPA and IDHW WAG managers to model the loss of 1 million gallons of water from the sewage lagoons. ANL-W has evaluated the one-million-gallon loss of sanitary waste with an estimated 3% solids from the sanitary lagoon and has determined that a data gap does not exist. The sewage lagoon was just being put into service when the leak occurred and the water loss was only sanitary sewage. The leak also occurred before the discharge of photo processing solutions to the sanitary system began. The results of 1994 sampling of sludge also indicated that metal levels did not pose a risk to groundwater. The contaminants in the raw water released are not known. Therefore, the source term for model calculations is not known. Furthermore, the release was sanitary waste water, so the presence of coliform bacteria in downgradient wells should indicate any impact to the aquifer. To date, samples of the two ANL-W downgradient production wells have never detected coliform bacteria.

3.1.1.1.2 Sludge Pit W of T-7 (Imhoff Tank) (ANL-19)—The Imhoff Tank and sludge pit collected sanitary waste from the power plant (Bldg. 768), the Fuel Conditioning Facility (Bldg. 765), the Laboratory and Office building (Bldg. 752), and the Fire House (Bldg. 759). The Imhoff Tank was used to settle out the sanitary wastes from 1963 to 1966. After settling, the sludge from the Imhoff Tank was pumped to the adjacent sludge pit. Liquid effluent from the Imhoff Tank was discharged to the EBR-II Leach Pit, approximately 61 m (200 ft) to the west of the Imhoff Tank. The dimensions of the Imhoff Tank were approximately 3.7 × 7.3 × 5.5 m (13 × 24 × 18 ft). The sludge pit was a vertical cylinder 0.9 m (3 ft) in diameter by 3.7 m (13 ft) tall located 1.5 m (5 ft) south of the Imhoff Tank. Engineering drawings indicate that all industrial wastes and laboratory chemicals were discharged separately through industrial waste lines that bypassed the Imhoff Tank/sludge pit. It is unlikely that hazardous constituents were disposed in the Imhoff Tank and sludge pit. The Imhoff Tank and sludge pit were cut down to 0.3 m (1 ft) below grade and filled with dirt in 1978. Because no potential source of hazardous materials is known to be associated with this site, no comparison with risk-based concentrations was conducted in the Track 1 DDP (RUST Geotech 1994a).

Based on the condition of the tank, a No Further Action Determination was recommended and signed by the remedial project managers (RPMs) in the Track 1 Decision Documentation Package.

3.1.1.1.3 EBR-II Sump (ANL-28)—The EBR-II Sump is a 2,500-L (660-gal) underground coated carbon steel tank, 1.5 m (5 ft) in diameter by 1.4 m (4.5 ft) in depth located just southwest of the Power Plant (Bldg. 768). The Sump is believed to have been installed in the early 1970s and is currently in use. The tank is a centralized collection facility for cooling tower blowdown, ion exchange regeneration effluent, and small quantities of laboratory chemicals from the water chemistry laboratory in the Power Plant before discharging via a pipe to the Main Cooling Tower Blowdown Ditch. Currently, the Power Plant is not operating, but, minor volumes of water chemistry water are still being discharged to the Main Cooling Tower Blowdown Ditch.

The sump was originally used to raise the pH of low-pH water derived from the cooling tower blowdown wastewater. Prior to 1980, hexavalent chromium was used as a corrosion inhibitor and hence, low levels of chromate's were discharged through the sump. This hexavalent chromium was chemically modified to trivalent chromium via the chromate reduction system, resulting in low-pH wastewater which was neutralized (pH 7.0 to 8.0) using caustic neutralization prior to discharge. The Power Plant regeneration effluents from the EBR-II makeup water demineralizer system were also discharged to the sump. The cation and anion demineralizers required regeneration using sulfuric acid and sodium hydroxide solutions respectively in order to remove their ionic impurities and restore their ionic exchange capacity. The pH of the demineralizer effluent was typically between 6 and 9, but it can vary between 4 and 11.

Since 1980, a phosphate-based corrosion inhibitor was used instead of hexavalent chromium. Chromate's have not been discharged through this sump since July 1980. The caustic injection system and pumps have since been removed from the sump, and wastewater currently flows directly through the sump to an underground pipe that discharges at the Main Cooling Tower Blowdown Ditch. Total discharges through the sump are estimated at 438 million gallons over 23 years. No sludges or sediment remain at the bottom of the tank.

Because no potential source of hazardous materials is known to be associated with this site, no comparison with risk-based concentrations was conducted in the Track 1 DDP (Rust Geotech 1994b). Therefore, a No Further Action Determination was recommended and signed by the RPMs in the Track 1 Decision Documentation Package.

3.1.1.1.4 Industrial Waste Lift Station (ANL-29)—The Industrial Waste Lift Station was installed on the east side of the ANL-W site in 1972. It receives the industrial waste effluents from the Zero Power Physics Reactor support wing (Bldg. 774), the Lab and Office Building (Bldg. 752), the EBR-II Engineering Laboratories (Bldgs. 772 and 789), and the Fuel Manufacturing Facility (Bldg. 704). The waste effluents from these facilities are then discharged, from the lift station, to the Industrial Waste Lift Station Discharge Ditch (ANL-35), also known as the North Ditch, which is located north of the Hot Fuel Examination Facility. The only contaminant of potential concern identified from process knowledge of water released to the Industrial Waste Lift Station is silver. Sludge samples collected in 1986 from the Industrial Waste Lift Station detected silver at 23,700 mg/kg. Silver recovery units were installed on photo processing units at ANL-W in September 1986 and solutions containing silver were not allowed to be directly discharged into the industrial waste systems. However, on October 3, 1990, photo processing solution was inadvertently discharged directly into the Industrial Waste Lift Station, bypassing the silver recovery units installed at the EBR-II Engineering Laboratory (Bldg. 772). Sludge samples collected in 1990 indicate 28 mg/kg of total silver. In 1990, the silver recovery units throughout ANL-W were modified and operating procedures were updated to prevent any further silver releases. A Track 1 investigation was originally performed for this site and, based on the above information, it was determined that the potential health risks are less than the lower limit of the NCP target risk range. A No Further Action Determination was recommended for the site and signed by the RPM's on July 29, 1994.

A review of all ANL-W Track 1 documentation packages identified an error in the calculations of silver in the Lift Station. So, additional sludge samples were collected from the bottom of the lift station in 1995 and analyzed for total silver, TCLP silver, and radionuclides using gamma spectrometry. Results of the gamma spectrometry indicate that Cs-137 was detected at a maximum concentration of 8.7 pCi/g. However, this sludge is located 4.6 m (15 ft) below ground surface, and the only complete exposure pathway (ie., from site to receptor) is the groundwater pathway, which the maximum concentration is less than the risk-based concentration. The maximum detected soil concentration of silver is 5,400 mg/kg, and this concentration does not result in a potential health risk greater than the lower limit of the National

Contingency Plan (NCP) target risk range (ANL-W 1995b). An addendum was prepared and attached to the previously submitted Track 1 document. This addendum also recommended a No Further Action Determination which was signed by the RPM's on May 23, 1996.

3.1.1.1.5 Sanitary Waste Lift Station (ANL-30)—The Sanitary Waste Lift Station (Bldg. 778) was built in 1965. It receives all sanitary waste originating at ANL-W, with the exception of the Transient Reactor Test Facilities (Bldgs. 720, 721, 722, 724, and T-15), the Sodium Process Facility operations trailer, and the Sodium Components Maintenance Shop (Bldg. 793). The Sanitary Waste Lift Station, which consists of a sump approximately 1.8 m (6 ft) in diameter and 4.9 (16 ft) deep, discharges to the Sanitary Sewage Lagoons (ANL-04). Between 1975 and 1981, photo processing solutions were discharged from the Fuel Assembly and Storage Building to the Sanitary Waste Lift Station. The manager of Fuel Assembly and Storage Building during that period estimates that approximately 1.32 Troy ounces of silver was discharged to the Sanitary Waste Lift Station. Photo processing was discontinued at the Fuel Assembly and Storage Building in 1981; consequently, there has been no further releases to the Sanitary Waste Lift Station. Silver and low-levels of medical radionuclides are the only hazardous constituents potentially discharged to the lift station.

Because the maximum detected silver concentration (68 mg/kg) was less than the lowest risk-based soil concentration across all exposure pathways (1,350 mg/kg) (ANL-W 1994a), a No Further Action Determination was recommended and signed by the RPMs in the Track 1 Decision Documentation Package.

3.1.1.1.6 TREAT Photo Processing Discharge Ditch (ANL-36)—The Transient Reactor Test (TREAT) Photo Processing Discharge Ditch is located approximately 6.1 m (20 ft) northeast of and parallel to the Photo Lab (Bldg. 724) and the TREAT Office Building (Bldg. 721). The ditch is actually a very shallow [i.e., 15 cm (6 in.)] linear depression approximately 165 m (540 ft) long by approximately 1.8 m (6 ft) wide. Approximately 1,500 L (400 gal) of photo processing solutions are estimated to have been discharged to the ditch over the 2-year period from 1977 to 1979. It is unlikely that the photo processing solutions actually had an impact on the entire length of the ditch because of the small volume of solutions discharged to the ditch at any one time, and the relatively short length of time it was used. Wastes discharged to the ditch were generated in the Photo Lab. In 1987, 20 soil samples were collected from the ditch and qualitatively screened by x-ray spectrometry. Of these 20 soil samples, three were analyzed for total silver.

Because the maximum detected silver concentration (17 mg/kg) was less than the risk-based soil concentration (RUST Geotech 1994c), a No Further Action Determination was recommended and signed by the RPMs in the Track 1 Decision Documentation Package.

3.1.1.1.7 Knawa Butte (ANL-60)—The Knawa Butte is located due north of the Hot Fuel Examination Facility (Bldg. 785) near the security fence. As ANL-W began to expand, previously undisturbed areas within the security perimeter became the site for new facilities. Miscellaneous construction debris, including refuse concrete, and also rocks and dirt from the excavation of the Hot Fuel Examination Facility and the Experimental Breeder Reactor-II (Bldg. 767) basements were disposed at Knawa Butte. The butte was used as a construction refuse pile until September 1972 when a service request was made to renovate the existing pile and convert it to a doughnut-shaped mound.

The butte continued to be utilized as a disposal area until October 1975, when it was decided, because of tightened security control, that construction refuse should be disposed of elsewhere. ANL-W personnel concluded that future excavation material (i.e., rock and dirt) would be dumped into a man-made depression, which developed during construction of the Zero Power Physics Reactor mound, located approximately 457 m (1,500 ft) south of ANL-W. The butte was then covered with clean soil and planted with grasses to aid the ecological recovery of the area. During May of 1986, a security bunker was installed in the northern-most section of the butte. The bunker was used to store ammunition and continues to be utilized by ANL-W Security today. In September of 1992, several 3-ft-deep holes were dug in the Knawa Butte that verified that its contents were actually excavation and construction debris. Because no potential source of hazardous constituents is known to be associated with this site, no comparison with risk-based concentrations was conducted in the Track 1 DDP (ANL-W 1994b).

Because no sources of hazardous constituents exist at this site, a No Further Action Determination was recommended and signed by the RPMs in the Track 1 Decision Documentation Package.

3.1.1.1.8 EBR-II Transformer Yard (ANL-61)—The EBR-II Transformer Yard located south of the EBR-II Power Plant (Bldg. 768) is the site of PCB and diesel fuel contamination. The PCB contamination is due to historic (i.e., prior to 1978) leakage from four transformers. All four transformers were replaced and the majority of the contaminated soil was removed during a cleanup action from 1988 through 1992. Approximately 54 m^3 (70 yd^3) of PCB-contaminated soil was removed and transported to an offsite disposal facility. The concrete pads supporting the transformers were solvent cleaned, etched, and coated with epoxy resin as a temporary mitigation measure. Additional soil sampling was performed in 1991, and an additional 386 m^3 (505 yd^3) of PCB-contaminated soil and concrete were removed in 1992. One hundred and sixty-six verification soil samples were collected in 1992. Three of these verification soil samples had PCB concentrations greater than the Toxic Substances Control Act Action Limit of 25 mg/kg. These soil samples were collected directly below Transformer #3 and directly above the basalt at approximately 2.3 to 2.4 m (7.5 to 8.0 ft) below ground surface. At these locations, the soil was removed to bedrock and a bentonite barrier was placed directly above the basalt. The area was then backfilled with clean soil and new transformers installed. Thirty-eight additional verification soil samples were collected in a ditch south of the transformer yard. Two of the soil samples has PCB concentrations greater than the 25-mg/kg action limit. Therefore, 14 verification soil samples were collected in this area. Two soil samples had PCB concentrations above the action limit. The soil was removed and 12 additional verification samples were collected. Those 12 soil samples had PCB concentrations below the action limit. Six soil samples were collected east of the transformer yard. Two soil samples located near an underground storage tank had PCB concentrations of 55 mg/kg and 39 mg/kg. None of the soil samples had PCB contamination greater than the risk-based concentration (RUST Geotech 1994d).

A No Further Action Determination was recommended and signed by the RPMs in the Track 1 Decision Documentation Package pending removal of the last section of PCB-contaminated soil. However, because this soil near the underground storage tank has not been removed, and no risk evaluation has been performed for this area of contaminated soil, it is identified as a new site (ANL-61A) and is discussed in Step 2, Section 3.1.2.

3.1.1.1.9 Sodium Boiler Building Hotwell (ANL-62)—The Sodium Boiler Building (Bldg. 766) condensate hotwell, built in 1962, is located north of the EBR-II Power Plant (Bldg. 768). This hotwell, which is identical to the EBR-II Power Plant condensate hotwell, receives water from the steamtrap and condensate drains. Water contained in the Sodium Boiler Building Hotwell sump is pumped back into the system instead of being discharged to the environment.

The boiler feedwater treatment program, from initial startup to September 1986, utilized a 35% solution of hydrazine as an oxygen scavenger and morpholine as a neutralizing amine. In September 1986, the treatment program was modified and now uses a carbohydrazide as an oxygen scavenger and a blended neutralizing amine (dimethylisopropanolamine and aminomethylpropanol). Tritium, produced in the EBR-II Reactor, migrates through the evaporator and superheater tube walls to the steam system. The level of the tritium in the condensate averages about 10^{-5} µCi/mL, which is below the DOE Order 5480.11 limits on effluent discharge of radionuclides to the environment of 3×10^{-3} µCi/mL. To verify that there has been no migration of tritium from the condensate to the groundwater table, tritium analyses were performed on a monthly basis until November 1995, when it was changed to a quarterly basis on groundwater from the two production wells at ANL-W. Tritium has not been detected.

The total discharge of hydrazine from the Sodium Boiler Building hotwell is less than 4 mg/yr during normal operation. Although trace quantities of hydrazine are present in the condensate, these minute amounts will scavenge oxygen in the hotwell or the industrial waste feeder ditch and be consumed. Because neither of the hazardous constituents believed to have been present at the site were detected(hydrazine and tritium), no comparison with risk-based concentration was made in the Track 1 DDP (ANL-W 1994c).

Because no hazardous constituents have been identified as being present at this site, a No Further Action Determination was recommended and signed by the RPMs in the Track 1 Decision Documentation Package.

3.1.1.1.10 Septic Tank 789-A (ANL-63)—This septic tank is located approximately 18 m (60 ft) northeast of the Equipment Building (Bldg. 789-A) and was believed to have been installed in the late 1950s. No buildings currently discharge to the septic tank and it was not shown on any ANL-W engineering drawings. An employee who worked at ANL-W in 1961 reported that construction trailers located near the septic tank were being dismantled and moved at that time. The septic tank was not in use, and the outer ANL-W fence was located approximately 33 m (100 ft) to the west of the tank/trailers. Therefore, it is assumed that the septic tank only received sanitary waste effluent from the temporary construction trailers prior to the beginning of operations at ANL-W. The tank was inadvertently discovered in 1986 when a fire hydrant in the vicinity was being replaced. It is reported that there was fluid in the tank and a sample was collected for radioactive analysis. The analytical results are reported to have indicated no radioactive contamination, although the actual laboratory results cannot be located. After confirmation that the tank was actually a septic, and laboratory results indicated no radioactive contamination the tank was backfilled inplace. Because no potential source of hazardous materials is known to be associated with this site, no comparison with risk-based concentrations was conducted on the Track 1 DDP (RUST Geotech 1994e).

Because this septic tank did not receive any hazardous constituents, a No Further Action Determination was recommended and signed by the RPMs in the Track 1 Decision Documentation Package.

3.1.1.2 OU 9-02. OU 9-02 consists of one site, the EBR-II Leach Pit (ANL-08). In addition, the inlet pipe to the leach pit from ANL-31 (OU 9-03) is discussed in Section 3.1.1.3.2. The EBR-II Leach Pit is located between the inner and outer security fences in the southwest corner of the ANL-W facility. The pit is an irregularly shaped, unlined underground basin approximately 5.5 m (18 ft) wide by 12 m (40 ft) long; the bottom of the Leach Pit is 4.6 m (15 ft) below ground surface. The Leach Pit was excavated into basalt bedrock in 1959 with explosives. A 20-cm (8-in.) thick reinforced-concrete slab lid was installed 1.5 m (5 ft) below land surface and covered with native soil to prevent ingress of wildlife and precipitation.

Initially, the pit received all of the liquid industrial waste including cooling tower blowdown, sanitary effluent, cooling condensates, and radioactive effluent, generated at the ANL-W facilities. Discharge of industrial waste ceased following construction of the industrial waste pond in 1962. Sanitary-waste discharge to the Leach Pit ceased when ANL-W completed the sanitary lagoons in 1965. Although the radioactive liquid-evaporation system was completed in 1971,[a] ANL-W used the Leach Pit for subsurface release of low-level radioactive effluent until 1973. The average annual discharge to the Leach Pit was approximately 9×10^4 gallons from 1960 to October 1973 containing a total of 10.4 curies of radioactivity (LATA 1990a). The residual curies remaining if all the radionuclides were in the Leach Pit would be 1.64 curies in 1994 (RUST Geotech 1994f).

According to Volume II of the *Monitoring, Analysis, and Test (MAT) Plan* (LATA, 1990b), the Laboratory and Office (L&O) building was the primary generator and collection point for liquid waste suspected of containing radioactive constituents. The majority of the wastes were produced in the L&O building chemistry laboratories, formerly the Hot Fuels Examination Facility-North, and the Fuel Conditioning Faciltiy (FCF), formerly the Hot Fuels Examination Facility-South (HFEF-S). The Fuel Assembly and Storage Facility, the FCF truck lock, the Building 768 change room, the component cleanup facility, and the Zero Power Physics Reactor generated minor amounts of liquid radioactive waste and transferred those waste to a receiving tank in the L&O building via a tanker truck; those wastes were ultimately discharged to the Leach Pit.

There are no records to indicate the types or quantities of nonradioactive contaminants that may have been discharged to the Leach Pit prior to startup of the industrial waste pond (LATA 1990b). However, because the laboratory and office building chemical laboratories were the primary contributor of waste, it is assumed that organic chemicals, solvents, and metal-bearing wastes were discharged to the Leach Pit.

The pit was used once since 1973. In November, 1975 tritiated water that exceeded the Energy Research and Development Administration (ERDA, now the Department of Energy) standards governing discharge to an uncontrolled area was discharged to the pit. Following that discharge, the pit was isolated from the liquid waste processing system by cutting the line at building 762 (LATA 1990a; ANL-W 1990).

Cooling tower blowdown containing trivalent or hexavalent chromium was a significant component of the nonradioactive industrial waste water discharged from 1962 to 1973; however, nonradioactive industrial wastewater was only discharged to the Leach Pit in early 1962, prior to startup of the industrial waste pond (ANL-W 1973).

In 1991, as part of a Track 2 investigation, soil samples were collected from the sludge in the leach pit (3), the first interbed (approximately 36) below the leach pit (1), and lateral locations outside the leach pit (2), and a groundwater sample was collected from a well drilled downgradient from the leach pit. Groundwater and soil samples were analyzed for VOCs, semivolatile organic compounds, metals, radionuclides, anions, and pH. The results indicate that the sludge samples in the leach pit and the soil sample collected in the first interbed had contamination. Results from the Track 2 type risk assessment indicate that cadmium concentrations exceed the TCLP limit. A Track 2-type risk assessment was performed, which indicated that OCDD detected in the groundwater presents a potential risk of 1E-06, or at the lower limit of the NCP target risk range. Groundwater concentrations of other constituents did not exceed the risk-based levels. Also, soil concentrations of metals are below the levels which are indicative of potential adverse health effects. But, Cs-137, Co-60, Sr-90, and I-129 soil concentrations exceed threshold concentrations established for decontamination and decommissioning of INEL sites (EG&G

a. Stewart, N., 1993, Argonne National Laboratory-West, Personal Communication with D. J. Haley, November 16.

1986), but below the lower limit of the NCP target risk range. Based on the results of this investigation the overburden and lid were removed in the fall of 1993 as part of a removal action conducted under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended. The majority of the sludge was removed in December 1993, the bottom of the Leach Pit was lined with 5 to 7 cm (2 to 3 in.) of bentonite clay and backfilled to grade. Cleanup verification samples were collected from the basalt. A risk evaluation performed on the concentration of the COPCs in the basalt and in the remaining sludge indicates that the total potential risk is 6E-06 from ingestion of groundwater contaminated with beryllium and Np-237, which is at the lower limit of the NCP target risk range (i.e., 1E-06) (RUST Geotech 1994f).

A Track 2 Summary Report was completed and signed by the RPMs that recommends a removal action. In the summary report following the removal action, ANL-W stated that the groundwater flow pattern in the vicinity of the leach pit would be addressed in the WAG 9 comprehensive RI/FS, in addition to the effects from exposure to the contaminants in the inlet pipe.

During the fall of 1996, ANL-W collected field samples from three interbeds below the Leach Pit. Samples were collected at 36, 60, and 147-ft below grade. These samples were collected in an effort to define the vertical extent of contamination below the Leach Pit (ie., verify if contamination has migrated to these deeper interbeds). The samples were submitted for a suite of analysis that consisted of radionuclides, metals, dioxin/furans, pesticides/PCBs, volatiles, and semi-volatiles. But, with a large suite of samples that required a large sample collected from the interbed, not all analysis could be performed for each interbed. The interbed at 36-ft contained an interbed of sufficient depth to collect the full suite of samples while, the two deeper interbeds at 60 and 147-ft contained only small interbeds. The results of the new samples is found in Appendix A, under the ANL-08 Interbed section. This new data will be compared to the results of the contaminant modeling and is discussed in more detail under the subsection in chapter 5 titled EBR Leach Pit Source Term.

3.1.1.3 OU 9-03. OU 9-03 consists of three miscellaneous sites.

3.1.1.3.1 ANL Open Burn Pits 1, 2, and 3 (ANL-05)—Three abandoned open burn pits are located at ANL-W. Two of the pits (2 and 3) are located side by side approximately 91 m (300 ft) north of the north security fence, and pit 1 is located between the north security fences. The pits were initially used to burn construction wastes, such as paper and wood as early as 1960. In addition, approximately 150 gals of organic wastes from analytical chemistry operations were disposed in the burn pits from 1965 to 1970. The organic wastes were dumped on the wastes and used as the ignition source for the burns. The exact locations of where the organic compounds were dumped is not known. These organic laboratory wastes were collected in a 5-gal glass carboy that was emptied into the pits prior to scheduled burns. After a burn, the pits were covered with a layer of native soil. Interviews with employees who worked at the site at the time indicate that approximately 25 to 30 gals per year of organic laboratory wastes were disposed in the pits over a 5-year period from 1965 to 1970, for a total of 150 gals. The organic wastes consisted primarily of toluene, xylene, hexane, isopropyl alcohol, butyl cellosolve, tributylphosphate, and mineral oil. Mineral oil accounted for approximately 50% of the organic mixture. Soil samples were collected from the burn pits in 1988 from a trench dug perpendicular to burn pit #3 and random soil samples were collected from all three burn pits in 1994. Soil samples were analyzed for volatile and semivolatile organic compounds, metals, PCBs, pesticides, dioxin/furans, and radionuclides. A preliminary risk assessment was performed that indicates that the potential risk from exposure to all contaminants detected is less than the lower limit of the NCP target risk range. Based on the results of the risk assessment, no further action was recommended and signed by the RPMs in the revised 9-03 Track 2 Summary Report (ANL-W 1995c).

3.1.1.3.2 Industrial/Sanitary Waste Lift Station (ANL-31)—The Industrial/Sanitary Waste Lift Station (Bldg. 760) is actively used on the sanitary side; however, the industrial side is inactive. Both the industrial and sanitary sides of the waste lift station are reinforced concrete approximately 1.8 x 1.8 x 4.2 m (6 x 6 x 14 ft). No hazardous constituents have been identified as being routed through the sanitary waste side. Acids and bases identified in the Initial Assessment for the "ANL Interceptor Canal" were discharged through the industrial waste side of the lift station. In 1995, samples were collected from the water and sludge and were analyzed for metals and radionuclides. Results from a Track 2 risk assessment indicated that several radionuclides pose a potential risk at the lower limit of the NCP target risk range (ANL-W 1995c). Therefore, under a best management practice, ANL-W removed the contamination source from the Lift Station to the Meter House (i.e., water, sludge, and piping) in November 1995. Also under a best management practice the remaining 27 m (90 ft) of the piping from the Meter House to the EBR-II Leach Pit was removed in the summer of 1996. Samples were collected in 1995 and 1996 and compared to the backward calculation of risk for the contaminants to determine if the contamination was removed to levels that would result in risks less than 1E-06. After all sources of contamination were removed, the industrial side lift station was filled with sand and capped with concrete in March 1996. Therefore, a No Further Action was recommended and signed by the RPMs in the revised 9-03 Track 2 Summary Report (ANL-W 1995c).

3.1.1.3.3 Fuel Oil Spill by Building 755 (ANL-34)—ANL-34 is the site of a 50-gal spill of #5 fuel oil from an aboveground storage tank. The #5 fuel oil was heated in order for it to flow into the tank. A sight glass used as a control mechanism failed when a certain pressure was exceeded during filling. At the time of the spill, the tank was surrounded by a large earthen berm approximately 1.2 m (4 ft) high and 18.3 x 18.3 m (60 ft x 60 ft) square at the inside base of the berm. The spilled fuel oil occupied an area approximately 1.5 m x 6.1 m (5 ft x 20 ft) and was confined within the berm area. A risk assessment was performed on the most mobile (i.e., naphthalene) and the most hazardous (i.e., benzene) constituents of fuel oil. The risk assessment indicates that the risk would be below the lower limit of the NCP target risk range. Based on this information, the revised 9-03 Track 2 Summary Report (ANL-W 1995c) recommends No Further Action, and the summary report was signed by the RPMS.

3.1.1.4 OU 9-04. OU 9-04 consists of five sites. These sites are involved with the transport of surface water runoff, cooling tower blowdown water, and other liquid waste disposal ditches to the Industrial Waste Pond.

3.1.1.4.1 Industrial Waste Pond and Three Cooling Tower Blowdown Ditches (ANL-01)—The Industrial Waste Pond (IWP) is an unlined, approximately 1.2-ha (3-acre) evaporative seepage pond fed by the Interceptor Canal and site drainage ditches. The pond was excavated in 1959, with a maximum water depth of about 4 m (13 ft), and is still in use today. During this time, the Cooling Tower Blowdown ditches have been rerouted several times. ANL-W auxiliary cooling tower blowdown ditches convey industrial wastewater from the EBR-II Power Plant and the Fire Station (Bldgs. 768 and 759) to the Industrial Waste Pond. The IWP was originally included with the Main Cooling Tower Blowdown Ditch (MCTBD) as a Land Disposal Unit under the RCRA Consent Order and Compliance Agreement on the basis of potentially corrosive liquid wastes discharged with the cooling tower effluent. However, ANL-W conducted a field demonstration with the EPA and State of Idaho representatives in attendance in July 1988 that showed that any potentially corrosive wastes discharged to the IWP were neutralized in the MCTBD before reaching the IWP. On that basis, EPA removed the IWP as an Land Disposal Unit and re-designated it as a Solid Waste Management Unit. Therefore, this site is still under the regulatory authority of RCRA in addition to being on the FFA/CO and under the regulatory authority of CERCLA.

The Industrial Waste Pond will receive liquid cooling water discharges from the Sodium Process Facility. The cooling waters discharges will average 100 gallons per minute and will last for two years starting in the spring of 1997 and lasting until summer of 1999. These cooling water releases will be discharged to the surface drainage ditch on the North side of ANL-W and drains approximately 250 west to the Industrial Waste Pond. The Sodium Process Facility is a permitted HWMA/RCRA facility with discharge limits on the liquid effluent.

Currently, all three ditches (i.e., Ditches A, B, and C) discharge to the MCTBD, which then discharges to the IWP. Because of the physical separation of these ditches to the pond, each ditch (A, B, and C) and the IWP will be screened separately. Samples have been collected from the soil, sludge, and water present in the IWP, and soil samples have been collected from the ditches A, B, and C. These samples were analyzed for volatile and semivolatile organic compounds, metals, PCBs, pesticides, herbicides, dioxin/furans, and radionuclides. Two risk assessments were performed at this site. Each risk assessment used different data (i.e., either pre- or post-1994 data). Each risk assessment indicated that it is unlikely that exposure to the contaminants will cause adverse health effects. However, the risk assessment using only the 1994 data only evaluated the soil ingestion exposure pathway (ANL-W 1995d). Therefore, a data gap exists for the other exposure pathways and will be completed in the RI/FS.

3.1.1.4.2 The Main Cooling Tower Blowdown Ditch (ANL-01A)—The Main Cooling Tower Blowdown Ditch (MCTBD) runs from the westside of the cooling tower north in between the security fence to the Industrial Waste Pond. It is an unlined channel approximately 213 m (700 ft) in length and 0.9 to 4.6 m (3 to 15 ft) wide. From 1962 to 1996, the ditch had been utilized to convey industrial wastewater from the Cooling Tower to the Industrial Waste Pond. The main source of impurities to the Industrial Waste Pond were water treatment chemicals used to regenerate the ion exchange resin, which removes minerals from cooling tower water used in the EBR-II steam system. From 1962 to July 1980, a chromate-based corrosion inhibitor was added to the Cooling Tower water. The blowdown contained significant quantities of hexavalent chromium. Ion exchange column regeneration discharges have occurred from 1962 to March 1986. Regeneration of these column is accomplished with sulfuric acid for cation columns and sodium hydroxide for anion columns.

In January 1986, a pH measurement of 1.86 was measured in the effluent discharged to the MCTBD. This classified the liquid wastes as corrosive according to 40 CFR 261.22. The site was then classified as a Land Disposal Unit under RCRA. In February 1986, pH measurements were taken at the outfall to the MCTBD at 10-minute intervals during a regeneration episode; over the 4-hour observation period, pH measurements at the outfall ranged between 1.6 and 2.0 for a total of approximately 40 minutes. A temporary neutralization system was installed in March, and a permanent neutralization tank was installed in October 1986. A few discharges of regeneration water occurred, but they were in small batches and were monitored before discharge. Since October 1986, after the tank was installed, reagents are being neutralized in a tank prior to discharge to the pond. In 1995, 21 soil samples were collected and analyzed for pH and soil buffering capacity. These measurements indicate that the pH in the soil ranged from 6.9 to 8.2 with the soil buffering capacity ranging from 26 to 165.

In October 19, 1995 a letter was submitted to the IDHW-DEQ from DOE requesting that this site be reclassified from a Land Disposal Unit to a Solid Waste Management Unit. The IDHW-DEQ responded in a letter dated December 18, 1995 and denied the request for removal of the LDU designation for the MCTBD. ANL-W, DOE, and EPA and IDHW project managers have determined that the closure of the MCTBD will follow CERCLA under the FFA/CO process with RCRA closure requirements [IDAPA 16.01.05.008 (40 CFR 264 Subpart G)] being strictly applicable. The agencies (ie., EPA IDHW, and DOE) have agreed, in accordance with section 1.3.1 of the Action Plan to the FFA/CO, that sites retaining the RCRA LDU designation will be evaluated under the CERCLA risk assessment process and if an unacceptable risk to human health or the environment is demonstrated via this process, then remediation will occur in accordance with the applicable substantive requirements of HWMA/RCRA. Otherwise, if no unacceptable risk is demonstrated through the CERCLA risk assessment process, then the site will be considered closed for HWMA/RCRA.

Soil samples were collected in 1987, 1988, and 1994 and were analyzed for volatile and semivolatile organic compounds, PCBs, pesticides, herbicides, dioxin/furans, metals, and radionuclides. Two risk assessments were performed at this site. Each risk assessment used different data (i.e., either the pre- or post-1994 data). As shown in ANL-W (1995e), a couple of the metals indicated that beryllium had a risk greater than the lower limit of the NCP target risk range for the occupational and residential soil ingestion and residential groundwater ingestion. The second risk assessment, performed using the 1994 data, indicates that no COCs were identified based on a comparison of the maximum detected concentrations to risk-based soil concentrations based on the soil ingestion exposure pathway only. Therefore, a data gap is evaluation of the other exposure pathways in a risk assessment.

3.1.1.4.3 The ANL-W Interceptor Canal (ANL-09)—The ANL-W Interceptor Canal was utilized to transport industrial waste to the Industrial Waste Pond and to divert spring runoff and other natural waters around the ANL-W facility for flood control. Between 1962 and 1975, two 4-in. pipes transported liquid industrial wastes and cooling tower effluent, to the Interceptor Canal. One line transported cooling tower blowdown water and regeneration effluent while the other line originated at the Industrial Waste Lift Station (Bldg. 760) and transported industrial wastes. Liquid radioactive wastes were discharged through the same line as the industrial wastes, but they were diverted to the EBR-II Leach Pit. Discharge of industrial wastes was discontinued in 1973, and discharge of cooling tower blowdown water was discontinued in 1975.

During cleanout operations at the Interceptor Canal in October 1969, abnormal background radioactivity was detected. Wastewater was diverted to an adjacent parallel ditch, and radioactive liquid waste was accidentally discharged, resulting in contamination to the surface soils of the adjacent ditch (ANL-01 Ditch B). Additional radiation surveys in 1969, 1973, and 1975 indicated that the entire length of the Interceptor Canal was contaminated. Approximately 3,471 m^3 (4,540 yd^3) of contaminated soil was identified and only 948 m^3 (1,240 yd^3) was targeted for removal. Of this soil that was removed, approximately 139 m^3 (182 yd^3) was disposed at the RWMC from 1975 to 1976, and remaining 809 m^3 (1,058 yd^3) of contaminated soil was removed and stockpiled on site (this stockpiled soil is being evaluated as part of the OU 10-06 ROD). The stockpiled soil was evaluated as part of 10-06, samples were collected and analyzed and they showed excess risks for external radiation exposure and food crop ingestion from the Cs-137 contamination. The contaminated soil was removed in 1995 and disposed of in the Warm Waste Pond. Verification samples indicated the risks from the stockpiled soil to be less than 1E-6. The remaining soil, 2,523 m^3 (3,300 yd^3) was left in the ANL-09-Mound and is being investigated as part of this report. Another survey conducted in 1993 indicated that two small areas had elevated readings above background. Therefore, additional soil sampling was performed in 1994. These soil samples were analyzed for metals and radionuclides.

For the majority of the metals that have maximum detected concentrations greater than background concentrations (i.e., arsenic, copper, lead, mercury, and silver), the maximum detected concentrations are only slightly higher (i.e., less than a factor of two) than background concentrations. For the radionuclides with maximum detected concentrations greater than background (i.e., Am-241, Co-60, Cs-134, Cs-137, Sr-90, and U-238) and that were collected at more than one depth (i.e., Am-241, Co-60, Cs-134, and Cs-137), all soil concentrations decreased with increased depth. A planer map of this area along with maps that show concentrations verses depth of arsenic, copper, lead, and mercury, Co-60 and Cs-137 are at the end of Appendix B.

The interceptor canal has been divided into two separate areas for the risk assessment. These two areas are the mound area, which consists of the dredged material placed on the canal bank, and the interceptor canal area. This site was divided to facilitate the modeling of the contaminants in each of these areas based on the major differences in contaminants.

A Track 2 risk assessment was performed that indicates that only the risks associated with exposure to arsenic (3E-04), Cs-137 (4E-04), and U-238 (4E-06) exceed the lower limit of the NCP target risk range (ANL-W 1995f). Arsenic exceeds the lower limit of the NCP target risk range for the groundwater and soil ingestion exposure pathways, Cs-137 and U-238 exceed this limit for the external exposure pathway, and U-238 also exceeds this limit for the groundwater ingestion exposure pathway. For the soil ingestion external exposure pathways, the risks for arsenic and Cs-137, respectively, exceeded the lower limit of the NCP target risk range for both the current occupational and 30-year future residential exposure scenarios.

3.1.1.4.4 The Industrial Waste Lift Station Discharge Ditch (ANL-35)—The Industrial Waste Lift Station Discharge Ditch, also known as the North Ditch, is located inside the security fences. The ditch is approximately 152 m (500 ft) in length with a bottom width of 0.91 to 1.2 m (3 to 4 ft). At any one time, there is approximately 5 to 8 cm (2 to 3 in.) of water in the ditch. The ditch receives industrial waste from a variety of facilities at ANL-W. From 1959 through 1966, the North Ditch was part of a surface water runoff ditch. From 1966 to 1972, the North Ditch received industrial wastewater from the Instrument and Test Facility (Bldg. 772) and the Sodium Process Demonstration Facility (Bldg. 789). After 1972, when the Industrial Waste Lift Station (Bldg. 778A), ANL-29, was installed, the North Ditch received waste from this lift station. Currently, the North Ditch receives wastewater from industrial waste sources discussed above.

In 1988, soil was excavated from the North Ditch in an effort to relieve clogging in the ditch by cattails and weeds. Analysis of soil samples remaining in and excavated from the ditch indicate that all metals except beryllium (5.8 mg/kg) were below risk-based soil concentration (3.89E-05 mg/kg). However, it should be noted that this risk-based soil concentration is less than background concentration (3.0 mg/kg). In addition, low concentrations of VOCs, dioxins/furans, and herbicides were detected. The excavated soil was boxed and disposed at the bulky waste landfill at the CFA in August 1993.

In 1994, additional soil samples were collected and analyzed for metals and radionuclides. The risk assessment performed using only the 1994 analytical results indicates that risks greater than the lower limit of the NCP target risk range (i.e.,) were exceeded for the contaminants arsenic (2E-5), hexavalent chromium (6E-6), Cs-137 (3E-5), and U-238 (5E-6) as per reference (ANL-W, 1995g). For arsenic, the risks from exposure through soil ingestion in the occupational exposure scenario and through both soil and groundwater ingestion in the future residential exposure scenario are greater than this limit, and for hexavalent chromium, the risks are greater than this limit for the inhalation of fugitive dust exposure pathway for both the current occupational and future residential exposure scenarios. For Cs-137 and U-238, the risks are greater than the lower limit of the NCP target risk range for the external exposure pathway for both the current occupational and future residential exposure scenarios.

3.1.1.4.5 The Cooling Tower Riser Pits (ANL-53)—The Cooling Tower Riser Pits are located approximately 3 m (10 ft) east of the Main Cooling Tower. Each of the four pits is approximately 3.7 m (12 ft) deep with 23 to 38 cm (9 to 15 in.) of soil covering the rock bottom. During winter shutdown periods of the Main Cooling Tower, the riser pipes were drained to prevent damage caused by freezing and the riser pits are used to collect this discharge. Soil samples were collected in 1989 at each of the riser pits and the north and south discharge pipes and were analyzed for arsenic, chromium, hexavalent chromium, lead, and mercury. This suite of analytes was chosen by review of the actual routine analytical results of the cooling water along with process knowledge of the chemicals added to the water. These five contaminants also were detected in samples of the Main Cooling Tower Blowdown from previous sampling activities which received much large quantities of the same water. The risk assessment performed in the Track 2 Preliminary Scoping Package indicates that the risk to human health is less than the lower limit of the NCP target risk range (RUST Geotech 1994g).

3.1.1.5 Sites with Wastes Generated at ANL-W that are in WAG 10. Two WAG 10 sites that contain radionuclide-contaminated soils have been investigated in the OU 10-06 RI/FS. The two sites are the ANL—Windblown area and ANL-W—Stockpile site. These two sites are located within a mile of WAG 9 and are included in the OU 9-04 for information only and memoralization purposes because the wastes had originated at WAG 9. Additional information on these two sites can be found in the 10-06 administrative record under INEL-94/0037 and INEL-95/0259. These two OU 10-06 sites will be incorporated into the OU 9-04 record of decision. The following two sections describe a short summary of the radionuclides detected and the associated risks.

3.1.1.5.1 ANL-W Windblown Area (OU 10-06). Areas of radioactive windblown contamination at all of the major facility areas (e.g., TAN, ICPP, ANL-W) were identified during an aerial survey in 1990. These areas of windblown contamination, along with nonwindblown radioactively contaminated soil, were grouped into OU 10-06 and evaluated in the RI/FS for that operable unit (Jessmore et al. 1996). At ANL-W, two windblown areas were identified. These areas are the TREAT area and the main facility at ANL-W. Soil samples were collected at both these facilities in 1993, and analytical results from soil samples collected by the Radiological and Environmental Sciences Laboratory (RESL, which is now called the Foundation) were used to evaluate risk from exposure to contaminants at the site. Dose equivalent rate measurements were also collected to evaluate the external exposure pathway.

Screening of the maximum detected soil concentrations and dose equivalent rates at both areas indicate that the COPCs at the site are Cs-137, Pu-238, and Pu-239/240 at the main windblown area and Cs-137 and Sr-90 at the TREAT area. All dose equivalent rates are below background levels; therefore, the external exposure pathway was not evaluated. Exposure scenarios evaluated were the current occupational and the 30-year future residential. Exposure pathways evaluated for the current occupational exposure scenario were soil ingestion and inhalation of fugitive dust and for the future residential exposure scenarios the exposure pathways evaluated were soil ingestion, fugitive dust inhalation, and food crop ingestion. The available information shows that the potential of groundwater contamination is insignificant and was not evaluated for the windblown areas.

Risks from the current occupational exposure scenario were less than the lower limit of the NCP target risk range (i.e., 1E-06). The only risk in the 30-year future residential exposure scenario greater than this limit is ingestion of food crops contaminated with Sr-90 at the TREAT windblown area. In the 30-year future residential exposure scenario, only Sr-90 at the TREAT windblown area exceeded the lower limit of the NCP target risk range (2E-06). In addition to human health, risks to ecological receptors was also evaluated, and it is highly unlikely that the COPCs will cause adverse effects to populations of exposed ecological receptors.

3.1.1.5.2 ANL—Stockpile site. The ANL-W Stockpile is an abandoned barrow pit that was excavated as part of road building activities near ANL-W in the 1950s. The barrow pit is located on the west side of the ANL-W entrance road and is approximately 300 ft long and 200 ft wide. In 1975, ANL-W personnel used the barrow pit to dispose of approximately 1,058 cubic yards of low-level radionuclide contaminanted soil that resulted from cleanup operations at the ANL-W Interceptor Canal. The soil was deposited in the barrow pit in 1975 because it was below the acceptance level for soils at the radioactive waste management complex.

The 10-06 Phase II field investigation was conducted at the ANL-W Stockpile to determine the nature and extent of radionuclide- and metal- contaminated soils within the stockpile. The analytical data show that radionuclide-contamination in the stockpile is not homogeneous, probably due to the manner of deposition. Radioactive hotspots were identified in the stockpile soil using field radiation survey instruments. Data were collected from three of the hotspots. Other particles similar to those detected by the project radiological control technician and analyzed in the laboratory are likely to exist within the bounds of the stockpile area. The vertical extent of manmade radionuclide-contamination is estimated at 3 ft with an area of approximately 20,840 square feet. The total estimated volume is 2,315 cubic yards.

The main radionuclide contaminant that was detected is Cs-137 with concentrations up to 26,700 pCi/g and contributing most of the risk. CO-60 and Pu-239 tend to occur at the same locations as Cs-137 but at much lower concentrations. Peak concentrations of Co-60 and Pu-239 are 1.21 and 0.27 pCi/g, respectively. Of the inorganics that were analyzed for based on process knowledge (chromium and manganese) none were determined to be contaminants of concern.

The human health risk assessment that was performed indicated that for the 100-year residential exposure the total risk is 5E-03, which is attributed to the external exposure (4E-03) and food crop ingestion (9E-04) from Cs-137. While the ecological risk assessment that was performed indicated that Cs-137 was the only radionuclide that posed a risk to ecological receptors at the site.

In 1996, a non-time critical removal action was performed on the radionuclide contaminated stockpile site. The contaminated soils were removed using large excavation equipment and the soil was transported to the Warm Waste Pond at Test Reactor Area. The preliminary remediation goal (PRG) for the Cs-137 contaminated soil was 16.7 pCi/g and remaining soils were below this level. The remaining risks associated with this site is 1E-05 which is within the NCP target risk range.

3.1.2 Step 2—Add Newly Identified and Unevaluated Sites

PCB-contaminated soil at ANL-61A, has been identified as an unevaluated site which will require additional investigation as part of OU 9-04. ANL-61A contains PCB contaminated soil at concentrations (39 and 55 mg/kg) just above the Toxic Substances Control Act limit (25 mg/kg). This soil was originally planned to be removed during replacement of a diesel underground storage tank in 1995. However, this tank has not been replaced, and the PCB-contaminated soil remains.

3.1.3 Steps 3–5—Eliminate No Action, No Source, and Low Risk Sites

In Step 3, sites for which a source did not exist were eliminated. A complete review of all "no further action", Track 1's, and Track 2 sites has been conducted as part of the OU 9-04 Comprehensive RI/FS to determine if any change in status has occurred since the original listing or signature by the RPMs. These sites are those which are designated No Action in the FFA/CO Action Plan and as a result, were not assigned to an OU, and those sites that were assigned to an OU but where no source was detected. The No Action sites generally consist of rubble piles generated from construction excavation activities at ANL-W. Twenty-five sites were eliminated in this step.

Six sites for which detected concentrations of all contaminants that were not likely to pose a threat to human health were eliminated in Step 4. This low risk determination is based on the results of previous investigations and risk evaluations (e.g., Track 1 or Track 2 investigation. Six sites were eliminated in this step.

The last step, Step 5, of the site screening was to identify the sites that will be retained and further evaluated in the contaminant screening process. Therefore only the seven sites listed as "retained" will be further evaluated using the contaminant screening methodology discussed in Section 3.2.). The type of investigation performed at each site is presented in Table 3-2

3.2 Soil Contaminant Screening Methodology

The contaminant screening method depicted in Figure 3-1 involved compiling all sampling data for each site retained in the site screening. The sources of sampling results used in the contaminant screening are various Track 1, Track 2, and other investigation reports. Once this site screening is completed those sites which are retained will undergo additional contaminant specific screening steps. Tables 3-3 through 3-18 summarize the maximum concentration of each contaminant found at each site, background concentrations of contaminants, frequency of exceedence, frequency of detection, and whether or not the contaminant was eliminated from the risk evaluation. If the contaminant was screened, the justification by step number (described below) is provided in the last column of each table. It should be noted that sludge samples are considered to be soil samples. As discussed in the *Final Scope of Work for the Waste Area Group 9 Comprehensive Remedial Investigation/Feasibility Study at the Idaho National Engineering Laboratory* (ANL-W 1995h), there are no complete exposure pathways (ie., plausible route of exposure from a site to a receptor) for human receptors from the surface water pathway. Thus, the typical surface water dermal exposure scenario from swimming is not evaluated at ANL-W. However, the analytical results for the surface water will be used to determine if the contaminants detected in the surface water were analyzed for in the sludges and subsurface soil.

In addition, although surface water exists at the Industrial Waste Pond and the North Ditch, exposure to the water in a residential scenario is not evaluated because the surface water comes from the cooling water from the Sodium Process Facility at ANL-W and would not exist in a future residential scenario. Occupational exposure to surface water is controlled through the use of "no trespassing" signs on the INEL and signs around the Industrial Waste Pond.

The two contaminant specific screening steps for the retained sites is presented below.

Step 1. Contaminant concentrations less than or equal to background concentrations were eliminated from the risk evaluation. Background concentrations were obtained from Rood et al. (1995). 95/95 upper tolerance limits for grab samples were used because no soil samples were composites. Contaminants were also eliminated if only one sample exceeded the 95/95 upper tolerance limits, but the concentration was less than the 95/99 upper tolerance limits for grab samples. If background concentrations were not available for a given contaminant, then the contaminant was retained unless it was not detected.

Step 2. Five inorganic constituents (i.e., calcium, iron, magnesium, potassium, and sodium) were evaluated to determine if they could be eliminated. AN EPA guidance document (EPA 1990), identifies these six constituents as essential nutrients that

Table 3-2. Summary of potential release sites retained or eliminated from risk evaluation of WAG 9.

OU	Subunit	Site description	Type of investigation	Eliminate/retain	Reason for elimination
None	ANL-10	Dry Well between T-1 and ZPPR Mound	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-11	Waste Retention Tank 783	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-12	Suspect Waste Retention Tank by 793	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-14	Septic Tank and Drain Fields (2) by 753	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-15	Dry Well by 768	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-16	Dry Well by 759 (2)	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-17	Dry Well by 720	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-18	Septic Tank and Drain Field by 789	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-20	Septic Tank and Drain Field by 793	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-21	TREAT Suspect Waste Tank and Leaching Field (Non-radioactive)	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-22	TREAT Septic Tank and Leaching Field	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-23	TREAT Seepage Pit and Septic Tank West of 720	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-24	Lab and Office Acid Neutralization Tank	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-25	Interior Building Coffin Neutralization Tank	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-26	Critical Systems Maintenance Degreasing Unit	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-27	Plant Services Degreasing Unit	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-32	TREAT Control Building 721 Septic Tank and Leach Field (present)	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
None	ANL-33	TREAT Control Building 721 Septic Tank and Seepage Pit	Environmental characterization	Eliminate	Screening methodology Step 3: no source.
9-01	ANL-04	ANL Sewage Lagoons	Track 1	Eliminate	Screening methodology Step 3: no source.
9-01	ANL-19	Sludge Pit West of T-7 (Imhoff Tank)	Track 1	Eliminate	Screening methodology Step 3: no source.

Table 3-2. (continued).

OU	Subunit	Site description	Type of investigation	Eliminate/retain	Reason for elimination
9-01	ANL-28	EBR-II Sump	Track 1	Eliminate	Screening methodology Step 3: no source.
9-01	ANL-29	Industrial Waste Lift Station	Track 1	Eliminate	Screening methodology Step 4: Eliminate per Track 1 findings risk <1E-06.
9-01	ANL-30	Sanitary Waste Lift Station	Track 1	Eliminate	Screening methodology Step 4: Eliminate per Track 1 findings risk <1E-06.
9-01	ANL-36	TREAT Photo Processing Discharge Ditch	Track 1	Eliminate	Screening methodology Step 4: Eliminate per Track 1 findings risk <1E-06.
9-01	ANL-60	Knawa Butte Debris Pile	Track 1	Eliminate	Screening methodology Step 3: no source.
9-01	ANL-61	EBR-II Transformer Yard	Track 1	Eliminate	Screening methodology Step 4: Eliminate per Track 1 findings risk <1E-06.
9-01	ANL-61A	PCB-contaminated soil adjacent to ANL-61	No previous investigation	Retain	
9-01	ANL-62	Sodium Boiler Building (766) Hotwell	Track 1	Eliminate	Screening methodology Step 3: no source
9-01	ANL-63	Septic Tank 789-A	Track 1	Eliminate	Screening methodology Step 3: no source
9-02	ANL-08	EBR-II Leach Pit (Radioactive)	Track 2	Retain	
9-03	ANL-05	ANL Open Burn Pits #1, #2, and #3	Track 2	Eliminate	Screening methodology step 4: eliminate per Track 2 finding risk < 1E-06
9-03	ANL-31	Industrial/Sanitary Waste Lift Station (Industrial Side Not Used)	Track 2	Eliminate	Screening methodology step 3: no source.
9-03	ANL-34	Fuel Oil Spill by Building 755	Track 2	Eliminate	Screening methodology Step 4: Eliminate because Track 2 findings risk <1E-06.
9-04	ANL-01	Industrial Waste Pond and Cooling Tower Blowdown Ditches (3)	RI/FS	Retain	
9-04	ANL-01A	Main Cooling Tower Blowdown Ditch	RI/FS	Retain	
9-04	ANL-09	ANL Interceptor Canal	RI/FS	Retain	
9-04	ANL-35	Industrial Waste Lift Station Discharge Ditch	RI/FS	Retain	
9-04	ANL-53	Cooling Tower Riser Pits	RI/FS	Retain	
10-06		ANL-W Radionuclide Windblown Soil and Stockpile soil sites in WAG 10	RI/FS	Eliminate	Risks within NCP risk range

can be screened from evaluation in the risk assessment. ANL-W also recognizes that if these nutrient concentrations are excessive, they can have detrimental affects on humans. Thus, ANL-W is using a ten times the INEEL background as the screening value for excessive nutrient concentrations.

3.3 Surface Water Contaminant Screening Methodology

No natural, permanent surface water features exist on or near the ANL-W site. The existing surface water features are man-made drainage ditches, sewage lagoons, and a discharge pond which were constructed for ANL-W operations for the collection of intermittent surface runoff and process effluent. Seepage of wastewater, from facility operations that dispose to the ponds and ditches, contributes recharge to the Snake River Plain aquifer (SRPA), that is otherwise limited to recharge from infiltrating precipitation as snow or rain.

Current and future seepage from the Industrial Waste Pond (ANL-01—IWP), associated conveyance ditches (Ditch A, Ditch B, and Ditch C), and past liquid disposal activities to the EBR-II Leach Pit (ANL-08) during the operational period (1959–1973) represent the largest anthropogenic sources of recharge to the SRPA. All of the EBR-II Leach Pit disposal activities occurred in subsurface line leaks, meter house leaks, and pit seepage. Liquid discharge rates and contaminant concentrations that were used for OU 9-04 are discussed in detail in Sections 5.4 and 5.6.

The IWP has been used since 1961 to receive main and auxiliary cooling tower blowdown water. The discharge rate to the pond varies from 1.42 to 4.22 million gallons per year (mgy) (CH2M Hill 1978). Over the period 1961 to 1970, approximately 24 mgy was discharged to the IWP. For the period July 1971 to June 1978, the average rate was 31.7 mgy. For the period 1979 to 1994, the rate averaged 39 mgy. Table 3-19 presents the annual discharge rates for liquid effluent to the ANL-01 ditch and pond system. No records were kept in 1962 of water discharged to the Industrial Waste Pond. Due to the shutdown of the EBR-II reactor and other activity curtailments at ANL-W, liquid effluent discharges to the ANL-01 ditches have not been sufficient enough to reach the IWP since 1995 (i.e., all liquid infiltrates or evaporates from the ditches before reaching IWP). Recharge of the IWP will occur with the anticipated start up of the Sodium Process Facility. Flow to the IWP is anticipated to be approximately 100 gpm when this Sodium Process Facility comes on line (FY 1997), and discharges are expected to last for two years(Martin 1996).

During EBR-II reactor operations, flow in ANL-35 (North Ditch) averaged 30 gallons per minute (gpm). Currently, flow in this ditch ranges from 5-15 gpm. Due to the shutdown of the EBR-II reactor and other activity curtailments at ANL-W, liquid effluent discharges to ANL-35 have not been sufficient enough to reach the IWP (i.e., all liquid infiltrates or evaporates from this ditch before reaching IWP).

The lack of natural water bodies at ANL-W allows effluent discharges to the North Ditch and consequently to IWP to occur without the requirement of meeting any permit limits. National Pollutant Discharge Elimination System (NPDES) permits are only required for discharges to natural surface water features. Discharge permits have not been required although a land application permit has been written. However, as a method for ensuring that the internal ANL-W procedure for approving surface water discharges is working properly, water in the North Ditch and the IWP have been frequently sampled for contamination. Analysis of the surface discharged effluent sampling program is presented later in this section.

Table 3-3. Contaminant screening process for OU 9-01, ANL-61A, PCB-contaminated soil adjacent to ANL-61.

Contaminant	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration (mg/kg or pCi/g)	Frequency of exceedance[a]	Frequency of detection[b]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
PCBs	55	—[c]	2/6 (33%)	2/6 (33%)	No	NA

a. Expressed as number of detections above background/total number of samples analyzed and as a percent.
b. Expressed as number of detections/total numbers of samples analyzed and as a percent.
c. No background concentration is available. Therefore, any detection is considered to exceed background.
NA Not applicable.

Table 3-4. Contaminant screening process for OU 9-02, ANL-08—Extents.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	6122.25	24,000	0/2 (0%)	2/2 (100%)	Yes	1
Antimony	12.15	7.4	2/2 (100%)	2/2 (100%)	No	NA
Arsenic	11.93	7.4	1/2 (50%)	2/2 (100%)	No	NA
Barium	136.99	440	0/2 (0%)	2/2 (100%)	Yes	1
Beryllium	0.56	3	0/2 (0%)	2/2 (100%)	Yes	1
Cadmium	4.82	3.7	2/2 (100%)	2/2 (100%)	No	NA
Calcium	80,595.27	39,000	1/2 (50%)	2/2 (100%)	Yes[f]	2
Chromium	15.47	50	0/2 (0%)	2/2 (100%)	Yes	1
Cobalt	7.29	18	0/2 (0%)	2/2 (100%)	Yes	1
Copper	18.73	32	0/2 (0%)	2/2 (100%)	Yes	1
Cyanide	0.96	—[e]	2/2 (100%)	2/2 (100%)	No	NA
Iron	11,365.54	35,000	0/2 (0%)	2/2 (100%)	Yes	1
Lead	13.54	23	0/2 (0%)	2/2 (100%)	Yes	1
Magnesium	8,323.17	19,000	0/2 (0%)	2/2 (100%)	Yes	1
Manganese	254.77	700	0/2 (0%)	2/2 (100%)	Yes	1
Mercury	0.41	0.074	2/2 (100%)	2/2 (100%)	No	NA
Nickel	20.97	55	0/2 (0%)	2/2 (100%)	Yes	1
Potassium	1,661.12	6,300	0/2 (0%)	2/2 (100%)	Yes	1

Table 3-4. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Selenium	ND	0.34	0/2 (0%)	0/2 (0%)	Yes	1
Silver	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Sodium	312.08	520	0/2 (0%)	2/2 (100%)	Yes	1
Sulfate	15.8	—[e]	2/2 (100%)	2/2 (100%)	No	NA
Thallium	6.91	0.68	2/2 (100%)	2/2 (100%)	No	NA
Vanadium	18.32	70	0/2 (0%)	2/2 (100%)	Yes	1
Zinc	44.76	220	0/2 (0%)	2/2 (100%)	Yes	1
Am-241	0.32	0.019	2/2 (100%)	2/2 (100%)	No	NA
Ce-144	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Co-58	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Co-60	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Cs-134	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Cs-137	0.44	1.28	0/2 (0%)	1/2 (50%)	Yes	1
I-129	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Np-237	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Pu-238	ND	0.0091	0/2 (0%)	0/2 (0%)	Yes	1
Pu-239/240	ND	0.19	0/2 (0%)	0/2 (0%)	Yes	1
Ru-106	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Sb-125	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1

Table 3-4. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Sr-90	5.92	0.76	1/2 (50%)	2/2 (100%)	No	NA
U-234	0.17	1.95	0/2 (0%)	2/2 (100%)	Yes	1
U-235	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
U-238	0.14	1.85	0/2 (0%)	2/2 (100%)	Yes	1
Y-90	6	—[e]	2/2 (100%)	2/2 (100%)	No	NA
OCDD	5.2 E-8	—[e]	1/2 (50%)	1/2 (50%)	No	NA

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
NA Not applicable.
ND Non detect.

Table 3-5. Contaminant screening process for OU 9-02, ANL-08—Sludge.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	15,036.72	24,000	0/3 (0%)	3/3 (100%)	Yes	1
Antimony	37.09	7.4	3/3 (100%)	3/3 (100%)	No	NA
Arsenic	52.8	7.4	2/3 (66.67%)	3/3 (100%)	No	NA
Barium	255.2	440	0/3 (0%)	3/3 (100%)	Yes	1
Beryllium	756.09	3	1/3 (33.34%)	3/3 (100%)	No	NA
Cadmium	49.78	3.7	3/3 (1[illegible]%)	3/3 (100%)	No	NA
Calcium	42,465.62	39,000	1/3 (33.34%)	3/3 (100%)	Yes[f]	2
Chromium	4,305.33	50	3/3 (100%)	3/3 (100%)	No	NA
Cobalt	12.55	18	0/3 (0%)	3/3 (100%)	Yes	1
Copper	18,839.4	32	3/3 (100%)	3/3 (100%)	No	NA
Cyanide	34.32	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Iron	29,961.4	35,000	0/3 (0%)	3/3 (100%)	Yes	1
Lead	287.98	23	3/3 (100%)	3/3 (100%)	No	NA
Magnesium	11,981.71	19,000	0/3 (0%)	3/3 (100%)	Yes	1
Manganese	352.61	700	0/3 (0%)	3/3 (100%)	Yes	1
Mercury	496.6	0.074	2/3 (66.67%)	2/3 (66.67%)	No	NA
Nickel	75.24	55	1/3 (33.34%)	3/3 (100%)	No	NA
Potassium	2,298.52	6,300	0/3 (0%)	3/3 (100%)	Yes	1

Table 3-5. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Selenium	0.15	0.34	0/3 (0%)	1/3 (33.34%)	Yes	1
Silver	22.63	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Sodium	1,047.99	520	1/3 (33.34%)	3/3 (100%)	No	NA
Sulfate	82.2	—[e]	2/3 (66.67%)	2/3 (66.67%)	No	NA
Thallium	22.4	0.68	3/3 (100%)	3/3 (100%)	No	NA
Vanadium	50.9	70	0/3 (0%)	3/3 (100%)	Yes	1
Zinc	3,016.8	220	3/3 (100%)	3/3 (100%)	No	NA
Am-241	0.65	0.019	1/3 (33.34%)	1/3 (33.34%)	No	NA
Ce-144	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Co-58	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Co-60	196	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Cs-134	1.8	—[e]	2/30 (66.67	2/3 (66.67%)	No	NA
Cs-137	29,110	1.28	3/3 (100%)	3/3 (100%)	No	NA
I-129	124	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Np-237	329	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Pu-238	0.21	0.0091	1/3 (33.34%)	1/3 (33.34%)	No	NA
Pu-239/240	2.86	0.19	1/3 (33.34%)	1/3 (33.34%)	No	NA
Ru-103	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Ru-106	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1

Table 3-5. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Sb-125	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Sr-90	2,247	0.76	3/3 (100%)	3/3 (100%)	No	NA
U-234	35.64	1.95	3/3 (100%)	3/3 (100%)	No	NA
U-235	2.18	—[e]	3/3 (100%)	3/3 (100%)	No	NA
U-238	3.54	1.85	2/3 (66.67%)	3/3 (100%)	No	NA
Y-90	2,247	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Acetone	1.1	—[e]	2/3 (66.67%)	2/3 (66.67%)	No	NA
Anthracene	0.11	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Aroclor-1254	6.1	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Aroclor-1260	1.8	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Benzo(a)anthracene	0.48	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Benzo(k)fluoranthene	0.45	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Butylbenzylphthalate	0.051	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Chrysence	0.63	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Di-n-butylphthalate	0.17	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Fluoranthene	0.17	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
HPCDD	1.04 E-4	—[e]	3/3 (100%)	3/3 (100%)	No	NA
HPCDF	1.52 E-5	—[e]	3/3 (100%)	3/3 (100%)	No	NA
HXCDD	7.64 E-5	—[e]	3/3 (100%)	3/3 (100%)	No	NA

Table 3-5. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
HXCDF	1.5 E-5	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Methylene chloride	0.074	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
OCDD	4.19 E-4	—[e]	3/3 (100%)	3/3 (100%)	No	NA
OCDF	7.2 E-6	—[e]	3/3 (100%)	3/3 (100%)	No	NA
PECDD	5.6 E-6	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
PECDF	5.6 E-6	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Phenanthrene	0.34	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Pyrene	0.67	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
TCDD	2.2 E-7	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
TCDF	6.5 E-7	—[e]	2/3 (66.67%)	2/3 (66.67%)	No	NA

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
NA Not applicable.
ND Non detect.

Table 3-6. Contaminant screening process for OU 9-02, ANL-08—Basalt.

Contaminant[d]	Maximum Detected Concentration (mg/kg or pCi/g)	Background Screening Concentration[a] (mg/kg or pCi/g)	Frequency of Exceedance[b]	Frequency of Detection[c]	Contaminant Eliminated? (Yes/No)	Justification for Elimination (Step Number)
Beryllium	ND	3	0/7 (0%)	0/7 (0%)	Yes	1
Chromium	ND	50	0/7 (0%)	0/7 (0%)	Yes	1
Thallium	ND	0.68	0/7 (0%)	0/7 (0%)	Yes	1
I-129	ND	—[e]	0/7 (0%)	0/7 (0%)	Yes	1
Np-237	ND	—[e]	0/7 (0%)	0/7 (0%)	Yes	1

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
ND Non detect.

Table 3-7. Contaminant screening process for OU 9-02, ANL-08—Interbeds.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	13,100	24,000	0/3 (0%)	3/3 (100%)	Yes	1
Antimony	14.91	7.4	1/3 (33.34%)	1/3 (33.34%)	No	NA
Arsenic	7.8	7.4	1/3 (33.34%)	3/3 (100%)	No	NA
Barium	350	440	0/3 (0%)	3/3 (100%)	Yes	1
Beryllium	0.95	3	0/3 (0%)	3/3 (100%)	Yes	1
Cadmium	8.02	3.7	1/3 (33.34%)	1/3 (33.34%)	No	NA
Calcium	194,075.47	39,000	3/3 (100%)	3/3 (100%)	Yes[f]	2
Chromium	28.69	50	0/3 (0%)	3/3 (100%)	Yes	1
Cobalt	11.54	18	0/3 (0%)	3/3 (100%)	Yes	1
Copper	37.7	32	1/3 (33.34%)	3/3 (100%)	No	NA
Cyanide	0.88	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Iron	17,100	35,000	0/3 (0%)	3/3 (100%)	Yes	1
Lead	14.8	23	0/3 (0%)	3/3 (100%)	Yes	1
Magnesium	15,900	19,000	0/3 (0%)	3/3 (100%)	Yes	1
Manganese	386	700	0/3 (0%)	3/3 (100%)	Yes	1
Mercury	0.52	0.074	1/3 (33.34%)	1/3 (33.34%)	No	NA
Nickel	22.9	55	0/3 (0%)	3/3 (100%)	Yes	1
Potassium	2,310	6,300	0/3 (0%)	3/3 (100%)	Yes	1

Table 3-7. (continued)

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Selenium	ND	0.34	0/3 (0%)	0/3 (0%)	Yes	1
Silver	3.14	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA
Sodium	1,050	520	2/3 (66.67%)	3/3 (100%)	Yes[f]	2
Sulfate	31.3	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Thallium	9.09	0.68	1/3 (33.34%)	1/3 (33.34%)	No	NA
Vanadium	35.3	70	0/3 (0%)	3/3 (100%)	Yes	1
Zinc	69.2	220	0/3 (0%)	3/3 (100%)	Yes	1
Ag-108M	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Ag-110M	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Am-241	0.0518	0.019	3/8 (37.5%)	7/8 (87.5%)	No	NA
Ce-144	ND	—[e]	0/4 (0%)	0/4 (0%)	Yes	1
Co-58	ND	—[e]	0/1 (0%)	0/1 (0%)	Yes	1
Co-60	1.93	—[e]	3/4 (75%)	3/4 (75%)	No	NA
Cs-134	ND	—[e]	2/4 (50%)	2/4 (50%)	Yes	1
Cs-137	93.6	1.28	1/4 (25%)	1/4 (25%)	No	NA
Eu-152	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Eu-154	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Eu-155	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Gross Beta	6.68	—[e]	2/3 (67%)	2/3 (67%)	No	NA

Table 3-7. (continued)

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
I-129	ND	—[e]	0/1 (0%)	0/1 (0%)	Yes	1
Mn-54	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Np-237	1.53	—[e]	1/1 (100%)	1/1 (100%)	No	NA
Pu-238	ND	0.0091	0/4 (0%)	0/4 (0%)	Yes	1
Pu-239/240	ND	0.19	0/4 (0%)	0/4 (0%)	Yes	1
Ru-103	ND	—[e]	0/1 (0%)	0/1 (0%)	Yes	1
Ru-106	ND	—[e]	0/4 (0%)	0/4 (0%)	Yes	1
Sb-125	ND	—[e]	0/4 (0%)	0/4 (0%)	Yes	1
Sr-90	1.43	0.76	1/4 (25%)	2/4 (50%)	No	NA
U-234	0.818	1.95	0/4 (100%)	4/4 (100%)	Yes	1
U-235	0.726	—[e]	4/7 (57%)	4/7 (57%)	No	NA
U-238	0.749	1.85	0/4 (0%)	4/4 (100%)	Yes	1
Y-90	0.2	—[e]	1/1 (100%)	1/1 (100%)	No	NA
Zn-65	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Di-n-butylphthalate	2	—[e]	1/2. (50%)	1/2. (50%)	No	NA
OCDD	2.4 E-7	—[e]	1/3 (33.34%)	1/3 (33.34%)	No	NA

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.

Table 3-7. (continued)

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)

e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
NA Not applicable.
ND Non detect.

Table 3-8. Contaminant screening process for OU 9-04, ANL-01—Industrial Waste Pond.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	31,800	24,000	1/18 (6%)	18/18 (100%)	Yes	1[g]
Antimony	7.66	7.4	1/10 (10%)	1/10 (10%)	No	NA
Arsenic	25	7.4	10/18 (56%)	12/18 (67%)	No	NA
Barium	406	440	0/22 (0%)	18/22 (82%)	Yes	1
Beryllium	2.2	3.0	0/18 (0%)	16/18 (89%)	Yes	1
Cadmium	7	3.7	4/22 (19%)	18/22 (82%)	No	NA
Calcium	139,000	39,000	13/18 (72%)	14/18 (78%)	Yes[g]	2
Chloride	44	—[e]	6/6 (100%)	6/6 (100%)	No	NA
Chromium	11,400	50	13/22 (59%)	22/22 (100%)	No	NA
Cobalt	17.9	18	0/18 (0%)	18/18 (100%)	Yes	1
Copper	137	32	9/18 (50%)	18/18 (100%)	No	NA
Cyanide	ND	—[e]	0/4 (0%)	0/4 (0%)	No	NA
Fluoride	9.1	—[e]	6/6 (100%)	6/6 (100%)	No	NA
Iron	42,800	35,000	1/18 (6%)	18/18 (100%)	Yes[g]	2
Lead	32.6	23	4/22 (18%)	18/22 (82%)	No	NA
Magnesium	74,700	19,000	2/18 (11%)	18/18 (100%)	Yes[g]	2
Manganese	746	700	1/18 (5%)	18/18 (100%)	No	NA
Mercury	6.8	0.074	8/18 (44%)	9/18 (50%)	No	NA
Nickel	65.2	55	2/18 (11%)	18/18 (100%)	No	NA

Table 3-8. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Nitrate	3.1	—[e]	4/4 (100%)	4/4 (100%)	No	NA
Phosphate	1.3	—[e]	4/4 (100%)	4/4 (100%)	No	NA
Potassium	8,110	6,300	2/18 (11%)	18/18 (100%)	Yes[g]	2
Selenium	3.3	0.34	3/18 (17%)	3/18 (17%)	No	NA
Silver	37.9	—[e]	12/22 (55%)	12/22 (55%)	No	NA
Sodium	1,310	520	9/18 (50%)	17/18 (94%)	Yes[g]	2
Sulfate	3,300	—[e]	7/8 (88%)	7/8 (88%)	No	NA
Thallium	ND	0.68	0/12 (0%)	0/12 (0%)	Yes	1
Vanadium	109	70	2/18 (11%)	18/18 (100%)	No	NA
Zinc	5,850	220	9/18 (50%)	18/18 (100%)	No	NA
1,1,1-Trichlorethane[d]	0.021	—[e]	4/7 (57%)	4/7 (57%)	No	NA
2,4,5-TP (Silvex)	27.6	—[e]	1/1 (100%)	1/1 (100%)	No	NA
2-Butanone	0.200	—[e]	6/7 (86%)	6/7 (86%)	No	NA
Acetone	0.130	—[e]	6/7 (86%)	6/7 (86%)	No	NA
Bis (2-Ethylhexyl) phthalate	.008	—[e]	2/2 (100%)	2/2 (100%)	No	NA
Chloroform	0.005	—[e]	2/7 (29%)	2/7 (29%)	No	NA
Diethylphthalate	.002	—[e]	1./2 (50%)	1./2 (50%)	No	NA
Di-n- Butylphthalate	0.009	—[e]	1./2 (50%)	1./2 (50%)	No	NA
Methylene chloride	0.300	—[e]	7/7 (100%)	7/7 (100%)	No	NA

Table 3-8. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Toluene	0.005	—[e]	2/7 (29%)	2/7 (29%)	No	NA
Ag-108m	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
Ag-110m	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
Am-241	ND	0.019	0/10 (0%)	0/10 (0%)	Yes	1
Ce-144	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
Cm-242	ND	—[e]	0/3(0%)	0/3 (0%)	Yes	1
Cm-244	0.11	—[e]	1/3 (33%)	1/3 (33%)	No	NA
Co-60	0.22	—[e]	7/12 (58%)	7/12 (58%)	No	NA
Cs-134	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
Cs-137	29.2	1.28	9/21 (43%)	20/21 (95%)	No	NA
Eu-152	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
Eu-154	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
Mn-54	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
Pu-238	0.003	0.0091	0/7 (0%)	1/7 (14%)	Yes	1
Pu-239/240	0.232	0.19	1/14 (7%)	6/14 (43%)	No	NA
Ra-226	1.21	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Ru-106	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
Sb-125	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
Sr-90	2.5	0.76	1/3 (33%)	1/3 (33%)	No	NA

Table 3-8. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Th-228	0.19	2.1	0/4 (0%)	1/4 (25%)	Yes	1
Th-230	1.6	1.88	0/4 (0%)	3/4 (75%)	Yes	1
Th-232	1.39	2.1	0/8 (0%)	5/8 (62%)	Yes	1
U-232	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
U-235	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1
U-238	1.6	1.85	0/3 (0%)	2/3 (67%)	Yes	1
Zn-65	ND	—[e]	0/10 (0%)	0/10 (0%)	Yes	1

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Cyanide is eliminated because based on process knowledge it is not a COC.
g. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
ND Non detect.
NA Not applicable.

Table 3-9. Contaminant screening process for OU 9-04, ANL-01—Ditch A.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	17,200	24,000	0/30 (0%)	30/30 (100%)	Yes	1
Antimony	ND	7.4	0/30 (0%)	0/30 (0%)	Yes	1
Arsenic	11.7	7.4	14/38 (37%)	37/38 (97%)	No	NA
Barium	334	440	0/38 (0%)	38/38 (100%)	Yes	1
Beryllium	1.1	3	0/30 (0%)	29/30 (97%)	Yes	1
Cadmium	2	3.7	0/38 (0%)	10/38 (26%)	Yes	1
Calcium	159,000	39,000	14/30 (47%)	30/30 (100%)	Yes[f]	2
Chromium	548	50	12/38 (32%)	38/38 (100%)	No	NA
Cobalt	14.8	18	0/30 (0%)	30/30 (100%)	Yes	1
Copper	82.7	32	10/30 (33%)	30/30 (100%)	No	NA
Cyanide	8.4	—[e]	3/30 (10%)	3/30 (10%)	No	NA
Iron	22,700	35,000	0/30 (0%)	30/30 (100%)	Yes	1
Lead	78.3	23	5/38 (13%)	38/38 (100%)	No	NA
Magnesium	12,900	19,000	0/30 (0%)	30/30 (100%)	Yes	1
Manganese	773	700	1/30 (3%)	30/30 (100%)	No	NA
Mercury	4.1	0.074	28/38 (74%)	28/38 (74%)	No	NA
Nickel	53.3	55	0/30 (0%)	30/30 (100%)	Yes	1
Potassium	4,390	6,300	0/30 (0%)	30/30 (100%)	Yes	1
Selenium	ND	0.34	0/38 (0%)	0/38 (0%)	Yes	1
Silver	1.6	—[e]	4/38 (11%)	4/38 (11%)	No	NA

Table 3-9. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Sodium	500	520	0/30 (0%)	30/30 (100%)	Yes	1
Thallium	1.6	0.68	1/30 (3%)	1/30 (3%)	No	NA
Vanadium	41.1	70	0/30 (0%)	30/30 (100%)	Yes	1
Zinc	844	220	8/30 (27%)	30/30 (100%)	No	NA
Ag-108M	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
Ag-110M	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
Am-241	ND	0.019	0/30 (0%)	0/30 (0%)	Yes	1
Ce-144	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
Cm-242	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Cm-244	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Co-60	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
Cs-134	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
Cs-137	0.18	1.28	0/30 (0%)	11/30 (37%)	Yes	1
Eu-152	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
Eu-154	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
Mn-54	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
Pu-238	ND	0.0091	0/2 (0%)	0/2 (0%)	Yes	1
Pu-239/240	0.11	0.19	0/2 (0%)	1/2 (50%)	Yes	1
Ru-106	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1

Table 3-9. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Sb-125	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
Sr-90	4.5	0.76	1/2 (50%)	1/2 (50%)	No	NA
Th-228	ND	2.1	0/2 (0%)	0/2 (0%)	Yes	1
Th-230	1.8	1.88	0/2 (0%)	1/2 (50%)	Yes	1
Th-232	ND	2.1	0/2 (0%)	0/2 (0%)	Yes	1
U-232	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
U-235	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1
U-238	5.8	1.85	1/2 (50%)	1/2 (50%)	No	NA
Zn-65	ND	—[e]	0/30 (0%)	0/30 (0%)	Yes	1

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
NA Not applicable.
ND Non detect.

Table 3-10. Contaminant screening process for OU 9-04, ANL-01—Ditch B.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	19,200	24,000	0/17 (0%)	17/17 (100%)	Yes	1
Antimony	ND	7.4	0/17 (0%)	0/17 (0%)	Yes	1
Arsenic	14	7.4	10/31 (32%)	25/31 (81%)	No	NA
Barium	1,690	440	1/31 (3%)	31/31 (100%)	No	NA
Beryllium	3.9	3	1/17 (6%)	17/17 (100%)	No	NA
Cadmium	4	3.7	1/31 (3%)	17/31 (55%)	No	NA
Calcium	79,200	39,000	10/17 (58%)	17/17 (100%)	Yes[f]	2
Chromium	4,530	50	14/31 (45%)	31/31 (100%)	No	NA
Cobalt	12.5	18	0/16 (0%)	16/16 (100%)	Yes	1
Copper	216	32	9/17 (53%)	17/17 (100%)	No	NA
Cyanide	ND	—[e]	0/11 (0%)	0/11 (0%)	Yes	1
Iron	22,900	35,000	0/17 (0%)	17/17 (100%)	Yes	1
Lead	50.2	23	9/31 (29%)	31/31 (100%)	No	NA
Magnesium	15,500	19,000	0/16 (0%)	16/16 (100%)	Yes	1
Manganese	705	700	1/16 (6%)	16/16 (100%)	No	NA
Mercury	4.1	0.074	9/31 (29%)	15/31 (48%)	No	NA
Nickel	62.4	55	1/17 (6%)	17/17 (100%)	No	NA
Potassium	5,000	6,300	0/17 (0%)	17/17 (100%)	Yes	1

Table 3-10. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Selenium	0.45	0.34	1/31 (3%)	1/31 (3%)	No	NA
Silver	1.1	—[e]	9/31 (29%)	9/31 (29%)	No	NA
Sodium	1,030	520	7/17 (41%)	17/17 (100%)	Yes[f]	2
Thallium	ND	0.68	0/11 (0%)	0/11 (0%)	Yes	1
Vanadium	44	70	0/17 (0%)	17/17 (100%)	Yes	1
Zinc	3,020	220	10/17 (59%)	17/17 (100%)	No	NA
1,1,1-Trichloroethane	0.006	—[e]	1/7 (14%)	1/7 (14%)	No	NA
2,4-D	0.087	—[e]	1/1 (100%)	1/1 (100%)	No	NA
Acetone	0.025	—[e]	3/7 (43%)	3/7 (43%)	No	NA
Di-n-butylphthalate	0.35	—[e]	1/1 (100%)	1/1 (100%)	No	NA
Methylene Chloride	0.023	—[e]	4/7 (57%)	4/7 (57%)	No	NA
bis(2-Ethylhexyl) phthalate	0.12	—[e]	1/1 (100%)	1/1 (100%)	No	NA
Ag-108M	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Ag-110M	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Am-241	ND	0.019	0/8 (0%)	0/8 (0%)	Yes	1
Ce-144	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Cm-242	ND	—[e]	0/1 (0%)	0/1 (0%)	Yes	1
Cm-244	ND	—[e]	0/1 (0%)	0/1 (0%)	Yes	1

Table 3-10. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Co-60	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Cs-134	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Cs-137	0.85	1.28	0/8 (0%)	6/8 (75%)	Yes	1
Eu-152	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Eu-154	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Mn-54	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Pu-238	ND	0.0091	0/1 (0%)	0/1 (0%)	Yes	1
Pu-239/240	ND	0.19	0/1 (0%)	0/1 (0%)	Yes	1
Ru-106	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Sb-125	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
Sr-90	ND	0.76	0/1 (0%)	0/1 (0%)	Yes	1
Th-228	ND	2.1	0/1 (0%)	0/1 (0%)	Yes	1
Th-230	ND	1.88	0/1 (0%)	0/1 (0%)	Yes	1
Th-232	ND	2.1	0/1 (0%)	0/1 (0%)	Yes	1
U-232	ND	—[e]	0/1 (0%)	0/1 (0%)	Yes	1
U-235	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1
U-238	ND	1.85	0/1 (0%)	0/1 (0%)	Yes	1
Zn-65	ND	—[e]	0/8 (0%)	0/8 (0%)	Yes	1

Table 3-10. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organics compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
NA Not applicable.
ND Non detect.

Table 3-11. Contaminant screening process for OU 9-04, ANL-01—Ditch C.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	18,700	24,000	0/18 (0%)	18/18 (100%)	Yes	1
Antimony	ND	7.4	0/18 (0%)	0/18 (0%)	Yes	1
Arsenic	12.8	7.4	4/24 (17%)	21/24 (88%)	No	NA
Barium	426	440	0/24 (0%)	24/24 (100%)	Yes	1
Beryllium	1.7	3	0/18 (0%)	18/18 (100%)	Yes	1
Cadmium	1.7	3.7	0/24 (0%)	13/24 (54%)	Yes	1
Calcium	190,000	39,000	17/18 (94%)	18/18 (100%)	Yes[f]	2
Chloride	37	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Chromium	131	50	3/24 (12%)	24/24 (100%)	No	NA
Cobalt	13.9	18	0/18 (0%)	18/18 (100%)	Yes	1
Copper	59	32	4/18 (22%)	18/18 (100%)	No	NA
Cyanide	12.2	—[e]	5/15 (33%)	5/15 (33%)	No	NA
Fluoride	7	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Iron	22,800	35,000	0/18 (0%)	18/18 (100%)	Yes	1
Lead	40.5	23	3/24 (12%)	24/24 (100%)	No	NA
Magnesium	19,800	19,000	1/18 (6%)	18/18 (100%)	Yes[f]	2
Manganese	565	700	0/18 (0%)	18/18 (100%)	Yes	1
Mercury	0.83	0.074	8/24 (33%)	10/24 (42%)	No	NA

Table 3-11. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Nickel	29	55	0/18 (0%)	18/18 (100%)	Yes	1
Nitrate	95	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Phosphate	17	—[e]	3/3 (100%)	3/3(100%)	No	NA
Potassium	5130	6300	0/18 (0%)	18/18 (100%)	Yes	1
Selenium	0.61	0.34	3/24 (12%)	3/24 (12%)	No	NA
Silver	7.3	—[e]	4/24 (17%)	4/24 (17%)	No	NA
Sodium	821	520	7/18 (39%)	18/18 (100%)	Yes[f]	2
Sulfate	620	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Thallium	1.5	0.68	1/15 (7%)	1/15 (7%)	No	NA
Vanadium	68.8	70	0/18 (0%)	18/18 (100%)	Yes	1
Zinc	312	220	1/18 (6%)	18/18 (100%)	No	NA
1,1,1-Trichloroethane	0.056	—[e]	3/3 (100%)	3/3 (100%)	No	NA
2-Butanone	0.11	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Acetone	0.069	—[e]	2/3 (67%)	2/3 (67%)	No	NA
Chloroform	0.003	—[e]	1/3 (33%)	1/3 (33%)	No	NA
Methylene Chloride	0.17	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Toluene	0.004	—[e]	2/3 (67%)	2/3 (67%)	No	NA
Ag-108M	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1
Ag-110M	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1

Table 3-11. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Am-241	ND	0.019	0/15 (0%)	0/15 (0%)	Yes	1
Ce-144	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1
Cm-242	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Cm-244	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Co-60	0.029	—[e]	3/18 (17%)	3/18 (17%)	No	NA
Cs-134	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1
Cs-137	0.23	1.28	0/18 (0%)	10/18 (56%)	Yes	1
Eu-152	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1
Eu-154	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1
Gross Alpha	3.8	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Gross Beta	7	—[e]	3/3 (100%)	3/3 (100%)	No	NA
K-40	17	32	0/3 (0%)	3/3 (100%)	Yes	1
Mn-54	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1
Pu-238	ND	0.0091	0/2 (0%)	0/2 (0%)	Yes	1
Pu-239/240	ND	0.19	0/2 (0%)	0/2 (0%)	Yes	1
Ru-106	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1
Sb-125	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1
Sr-90	0.09	0.76	0/5 (0%)	3/5 (60%)	Yes	1
Th-228	ND	2.1	0/2 (0%)	0/2 (0%)	Yes	1

Table 3-11. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Th-230	1.6	1.88	0/2 (0%)	1/2 (50%)	Yes	1
Th-232	ND	2.1	0/2 (0%)	0/2 (0%)	Yes	1
Tritium	1.69	—[e]	3/3 (100%)	3/3 (100%)	No	NA
U-232	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
U-235	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1
U-238	21	1.85	1/2 (50%)	1/2 (50%)	No	NA
Zn-65	ND	—[e]	0/15 (0%)	0/15 (0%)	Yes	1

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
NA Not applicable.
ND Non detect.

Table 3-12. Contaminant screening process for OU 9-04, ANL-01A—MCTBD.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	16,800	24,000	0/39 (0%)	37/39 (95%)	Yes	1
Antimony	56.1	7.4	8/31 (26%)	9/31 (29%)	No	NA
Arsenic	74.6	7.4	18/46 (39%)	45/46 (98%)	No	NA
Barium	434	440	0/46 (0%)	45/46 (98%)	Yes	1
Beryllium	4.2	3	1/39 (3%)	30/39 (77%)	No	NA
Cadmium	3.3	3.7	0/46 (0%)	16/46 (35%)	Yes	1
Calcium	91,200	39,000	24/39 (62%)	39/39 (100%)	Yes[f]	2
Chromium	2,200	50	17/46 (37%)	46/46 (100%)	No	NA
Cobalt	25.7	18	1/36 (3%)	23/36 (64%)	No	NA
Copper	999	32	15/39 (38%)	39/39 (100%)	No	NA
Cyanide	12.6	—[e]	6/39 (15%)	6/39 (15%)	No	NA
Iron	46,400	35,000	2/39 (5%)	39/39 (100%)	Yes[f]	2
Lead	138	23	15/46 (33%)	46/46 (100%)	No	NA
Magnesium	15,400	19,000	0/36 (0%)	36/36 (100%)	Yes	1
Manganese	1,180	700	4/36 (11%)	36/36 (100%)	No	NA
Mercury	13.4	0.074	22/46 (48%)	22/46 (48%)	No	NA
Nickel	540	55	4/39 (10%)	39/39 (100%)	No	NA
Potassium	3,940	6,300	0/39 (0%)	38/39 (97%)	Yes	1

Table 3-12. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Selenium	2.2	0.34	4/46 (9%)	4/46 (9%)	No	NA
Silver	94.7	—[e]	15/44 (34%)	15/44 (34%)	No	NA
Sodium	3,060	520	10/39 (26%)	32/39 (82%)	Yes[f]	2
Sulfate	ND	—[e]	0/1 (0%)	0/1 (0%)	Yes	1
Thallium	ND	0.68	0/39 (0%)	0/39 (0%)	Yes	1
Vanadium	74.1	70	1/39 (3%)	39/39 100(%)	No	NA
Zinc	2,130	220	9/39 (23%)	38/39 (97%)	No	NA
2,4-D	0.0064	—[e]	1/2 (50%)	1/2 (50%)	No	NA
Acetone	0.046	—[e]	1/1 (100%)	1/1 (100%)	No	NA
Di-n-butylphthalate	0.120	—[e]	2/2 (100%)	2/2 (100%)	No	NA
Di-n-octylphthalate	0.048	—[e]	1/2 (50%)	1/2 (50%)	No	NA
Diethylphthalate	0.002	—[e]	1/2 (50%)	1/2 (50%)	No	NA
Methylene Chloride	0.037	—[e]	1/1 (100%)	1/1 (100%)	No	NA
bis(2-Ethylhexyl) phthalate	0.096	—[e]	2/2 (100%)	2/2 (100%)	No	NA
Ag-108M	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
Ag-110M	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
Am-241	ND	0.019	0/35 (0%)	0/35 (0%)	Yes	1
Ce-144	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1

Table 3-12. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Cm-242	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Cm-244	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Co-60	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
Cs-134	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
Cs-137	0.23	1.28	0/35 (0%)	9/35 (0%)	Yes	1
Eu-152	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
Eu-154	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
Mn-54	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
Pu-238	ND	0.0091	0/2 (0%)	0/2 (0%)	Yes	1
Pu-239/240	ND	0.19	0/2 (0%)	0/2 (0%)	Yes	1
Ru-106	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
Sb-125	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
Sr-90	ND	0.76	0/2 (0%)	0/2 (0%)	Yes	1
Th-228	ND	2.1	0/2 (0%)	0/2 (0%)	Yes	1
Th-230	ND	1.88	0/2 (0%)	0/2 (0%)	Yes	1
Th-232	ND	2.1	0/2 (0%)	0/2 (0%)	Yes	1
U-232	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
U-235	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1
U-238	2.7	1.85	1/2 (50%)	1/2 (50%)	No	NA

Table 3-12. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Zn-65	ND	—[e]	0/35 (0%)	0/35 (0%)	Yes	1

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
NA Not applicable.
ND No detect.

Table 3-13. Contaminant screening process for OU 9-04, ANL-09—Canal.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	19,700	24,000	0/17 (0%)	17/17 (100%)	Yes	1
Antimony	ND	7.4	0/17 (0%)	0/17 (0%)	Yes	1
Arsenic	11.9	7.4	12/17 (71%)	14/17 (82%)	No	NA
Barium	341	440	0/17 (0%)	17/17 (100%)	Yes	1
Beryllium	1.3	3	0/17 (0%)	17/17 (100%)	Yes	1
Cadmium	1.6	3.7	0/17 (0%)	7/17 (41%)	Yes	1
Calcium	71,200	39,000	17/17 (100%)	17/17 (100%)	Yes[f]	2
Chromium	30.2	50	0/17 (0%)	17/17 (100%)	Yes	1
Cobalt	14.7	18	0/17 (0%)	17/17 (100%)	Yes	1
Copper	34.8	32	1/17 (6%)	17/17 (100%)	No	NA
Cyanide	ND	—[e]	0/17 (0%)	0/17 (0%)	Yes	1
Iron	25,500	35,000	0/17 (0%)	17/17 (100%)	Yes	1
Lead	39.7	23	2/17 (12%)	17/17 (100%)	No	NA
Magnesium	17,300	19,000	0/17 (0%)	17/17 (100%)	Yes	1
Manganese	632	700	0/17 (0%)	17/17 (100%)	Yes	1
Mercury	0.33	0.074	6/17 (35%)	6/17 (35%)	No	NA
Nickel	35.6	55	0/17 (0%)	17/17 (100%)	Yes	1
Potassium	5,680	6,300	0/17 (0%)	17/17 (100%)	Yes	1
Selenium	ND	0.34	0/17 (0%)	0/17 (0%)	Yes	1
Silver	1.6	—[e]	1/17 (6%)	1/17 (6%)	No	NA
Sodium	363	520	0/17 (0%)	16/17 (94%)	Yes	1

Table 3-13. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Thallium	ND	0.68	0/17 (0%)	0/17 (0%)	Yes	1
Vanadium	53.9	70	0/17 (0%)	17/17 (100%)	Yes	1
Zinc	145	220	0/17 (0%)	15/17 (88%)	Yes	1
Ag-108M	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1
Ag-110M	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1
Am-241	ND	0.019	0/69 (0%)	0/69 (0%)	Yes	1
Ce-144	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1
Cm-242	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Cm-244	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
Co-60	0.25	—[e]	8/69 (12%)	8/69 (12%)	No	NA
Cs-134	0.05	—[e]	1/69 (1%)	1/69 (1%)	No	NA
Cs-137	18	1.28	21/69 (30%)	43/69 (62%)	No	NA
Eu-152	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1
Eu-154	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1
Mn-54	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1
Pu-238	ND	0.0091	0/3 (0%)	0/3 (0%)	Yes	1
Pu-239/240	ND	0.19	0/3 (0%)	0/3 (0%)	Yes	1
Ru-106	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1
Sb-125	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1
Sr-90	ND	0.76	0/3 (0%)	0/3 (0%)	Yes	1

Table 3-13. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Th-228	ND	2.1	0/3 (0%)	0/3 (0%)	Yes	1
Th-230	1.5	1.88	0/3 (0%)	2/3 (67%)	Yes	1
Th-232	ND	2.1	0/3 (0%)	0/3 (0%)	Yes	1
U-232	ND	—[e]	0/3 (0%)	0/3 (0%)	Yes	1
U-235	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1
U-238	1.5	1.85	0/3 (0%)	2/3 (67%)	Yes	1
Zn-65	ND	—[e]	0/69 (0%)	0/69 (0%)	Yes	1

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
NA Not applicable.
ND Non detect.

Table 3-14. Contaminant screening process for OU 9-04, ANL-09—Mound.

Contaminant[a]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Ag-108M	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
Ag-110M	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
Am-241	0 '3	0.019	2/28 (7%)	2/28 (17%)	No	NA
Ce-144	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
Cm-242	ND	—[e]	0/6 (0%)	0/6 (0%)	Yes	1
Cm-244	0.06	—[e]	1/6 (17%)	1/6 (17%)	No	NA
Co-60	0.37	—[e]	11/28 (39%)	11/28 (39%)	No	NA
Cs-134	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
Cs-137	52	1.28	20/28 (71%)	28/28 (100%)	No	NA
Eu-152	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
Eu-154	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
Mn-54	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
Pu-238	ND	0.0091	0/6 (0%)	0/6 (0%)	Yes	1
Pu-239/240	ND	0.19	0/6 (0%)	0/6 (0%)	Yes	1
Ru-106	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
Sb-125	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
Sr-90	5.8	0.76	3/6 (50%)	3/6 (50%)	No	NA
Th-228	ND	2.1	0/6 (0%)	0/6 (0%)	Yes	1

Table 3-14. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Th-230	1.8	1.88	0/6 (0%)	3/6 (50%)	Yes	1
Th-232	ND	2.1	0/6 (0%)	0/6 (0%)	Yes	1
U-232	ND	—[e]	0/6 (0%)	0/6 (0%)	Yes	1
U-235	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1
U-238	2.3	1.85	1/6 (17%)	3/6 (50%)	No	NA
Zn-65	ND	—[e]	0/28 (0%)	0/28 (0%)	Yes	1

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
NA Not applicable.
ND Non detect.

Table 3-15. Contaminant screening process for OU 9-04, ANL-35, Industrial Waste Lift Station Discharge Ditch.

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Aluminum	29,800	24,000	1/24 (4%)	24/24 (100%)	Yes	1
Antimony	ND	7.4	0/15 (0%)	0/15 (0%)	Yes	1
Arsenic	12.1	7.4	7/36 (19%)	35/36 (97%)	No	NA
Barium	647	440	1/39 (3%)	38/39 (97%)	No	NA
Beryllium	5.8	3	2/24 (8%)	19/24 (79%)	No	NA
Cadmium	4.8	3.7	4/39 (10%)	27/39 (69%)	No	NA
Calcium	102,000	39,000	9/24 (38%)	24/24 (100%)	Yes[f]	2
Chloride	14	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Chromium	124	50	10/39 (26%)	39/39 (100%)	No	NA
Cobalt	27	18	1/22 (5%)	21/22 (95%)	No	NA
Copper	479	32	16/24 67(%)	24/24 (100%)	No	NA
Cyanide	14.3	—[e]	6/20 (30%)	6/20 (30%)	No	NA
Fluoride	4.8	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Iron	50,600	35,000	1/24 (4%)	24/24 (100%)	Yes[f]	2
Lead	47.2	23	8/39 (21%)	39/39 (100%)	No	NA
Magnesium	30,000	19,000	1/22 (5%)	22/22 (100%)	Yes[f]	2
Manganese	1,200	700	2/22 (9%)	22/22 (100%)	No	NA
Mercury	1.3	0.074	19/39 (49%)	24/39 (62%)	No	NA

Table 3-15. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Nickel	64.4	55	1/24 (4%)	24/24 (100%)	No	NA
Nitrate	22	—[e]	3/3 (100%)	3/3 (100%)	No	NA
Phosphate	2.5	—[e]	3/3 (100%)	3/3(100%)	No	NA
Phenols	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Potassium	7,390	6,300	1/24 (4%)	24/24 (100%)	Yes[f]	2
Selenium	0.78	0.34	2/36 (6%)	2/36 (6%)	No	NA
Silver	352	—[e]	33/39 (85%)	33/39 (85%)	No	NA
Sodium	936	520	13/24 (54%)	23/24 (96%)	Yes[f]	2
Strontium	63	—[e]	1./2 (50%)	1./2 950%)	No	NA
Sulfate	140	—[e]	3/5 (60%)	3/5 (60%)	No	NA
Thallium	0.7	0.68	1/21 (5%)	1/21 (5%)	No	NA
Vanadium	71.6	70	1/24 (4%)	24/24 (100%)	No	NA
Zinc	491	220	6/24 (25%)	22/24 (92%)	No	NA
1,1,1-Trichloroethane	0.53	—[e]	5/5 (100%)	5/5 (100%)	No	NA
2,4-D	0.091	—[e]	2/2 (100%)	2/2 (100%)	No	NA
2-Butanone	0.18	—[e]	3/5 (60%)	3/5 (60%)	No	NA
Acetone	0.22	—[e]	4/5 (80%)	4/5 (80%)	No	NA
Acetonitrile	0.0776	—[e]	1/2 (50%)	1/2 (50%)	No	NA

Table 3-15. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Butylbenzylphthalate	0.074	—[e]	1/2 (50%)	1/2 (50%)	No	NA
Chloroform	0.004	—[e]	1/5 (20%)	1/5 (20%)	No	NA
Di-n-butylphthalate	0.23	—[e]	2/2 (100%)	2/2 (100%)	No	NA
Di-n-octylphthalate	0.056	—[e]	1/2 (50%)	1/2 (50%)	No	NA
HpCDD	4.04 E-6	—[e]	2/2 (100%)	2/2 (100%)	No	NA
HpCDF	0.47 E-6	—[e]	1/2 (50%)	1/2 (50%)	No	NA
HxCDF	0.29 E-6	[e]	1/2 (50%)	1/2 (50%)	No	NA
Methylene Chloride	0.21	—[e]	5/5 (100%)	5/5 (100%)	No	NA
OCDD	9.99 E-6	—[e]	2/2 (100%)	2/2 (100%)	No	NA
OCDF	0.58 E-6	—[e]	2/2 (100%)	2/2 (100%)	No	NA
PeCDD	0.22 E-6	—[e]	1/2 (50%)	1/2 (50%)	No	NA
TCDF	0.47 E-6	—[e]	1/2 (50%)	1/2 (50%)	No	NA
Toluene	0.004	—[e]	3/5 (60%)	3/5 (60%)	No	NA
bis(2-Ethylhexyl) phthalate	0.37	—[e]	2/2 (100%)	2/2 (100%)	No	NA
Ag-108M	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
Ag-110M	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
Am-241	ND	0.019	0/20 (0%)	0/20 (0%)	Yes	1

Table 3-15. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Ce-144	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
Cm-242	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Cm-244	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
Co-60	0.035	—[e]	3/22 (14%)	3/22 (14%)	No	NA
Cs-134	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
Cs-137	2	1.28	2/22 (9%)	20/22 (91%)	No	NA
Eu-152	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
Eu-154	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
K-40	17	32	0/3 (0%)	3/3 (100%)	Yes	1
Mn-54	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
Pu-238	ND	0.0091	0/2 (0%)	0/2 (0%)	Yes	1
Pu-239/240	ND	0.19	0/2 (0%)	0/2 (0%)	Yes	1
Ru-106	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
Sb-125	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
Sr-90	0.1	0.76	0/5 (0%)	3/5 (60%)	Yes	1
Th-228	ND	2.1	0/2 (0%)	0/2 (0%)	Yes	1
Th-230	ND	1.88	0/2 (0%)	0/2 (0%)	Yes	1
Th-232	ND	2.1	0/2 (0%)	0/2 (0%)	Yes	1

Table 3-15. (continued).

Contaminant[d]	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Tritium	0.719	—[e]	3/3 (100%)	3/3 (100%)	No	NA
U-232	ND	—[e]	0/2 (0%)	0/2 (0%)	Yes	1
U-235	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1
U-238	2.3	1.85	1/2 (50%)	2/2 (100%)	No	NA
Zn-65	ND	—[e]	0/19 (0%)	0/19 (0%)	Yes	1

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. Only those organic compounds that were detected are presented. A complete listing of all the analytical results is presented in Appendix A.
e. No background concentration is available. Therefore, any detection is considered to exceed background.
f. Maximum detected concentration is less than 10 times the background concentration; therefore, the contaminant is eliminated.
NA Not applicable.
ND Non detect.

Table 3-16. Contaminant screening process for OU 9-04, ANL-53—Riser Pits.

Contaminant	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Arsenic	76	7.4	7/8 (88%)	7/8 (88%)	No	NA
Chromium	1,727	50	6/8 (75%)	8/8 (100%)	No	NA
Hexavalent Chromium	ND	—[d]	0/8 (0%)	0/8 (0%)	Yes	1
Lead	4,725	23	6/8 (75%)	8/8 (100%)	No	NA
Mercury	0.78	0.074	6/8 (75%)	8/8 (100%)	No	NA

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. No background concentration is available. Therefore, any detection is considered to exceed background.
NA Not applicable.
ND Non detect.

Table 3-17. Contaminant screening process for OU 9-04, ANL-53—South Discharge.

Contaminant	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Arsenic	7.7	7.4	1/5 (20%)	5/5 (100%)	No	NA
Chromium	56	50	1/5 (20%)	5/5 (100%)	No	NA
Hexavalent Chromium	ND	—[d]	0/5 (0%)	0/5 (0%)	Yes	1
Lead	13.9	23	0/5 (0%)	5/5 (100%)	Yes	1
Mercury	0.086	0.074	1/5 (20%)	5/5 (100%)	No	NA

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d No background concentration is available. Therefore, any detection is considered to exceed background.
NA Not applicable.
ND Non detect.

Table 3-18. Contaminant screening process for OU 9-04, ANL-53—North Discharge.

Contaminant	Maximum detected concentration (mg/kg or pCi/g)	Background screening concentration[a] (mg/kg or pCi/g)	Frequency of exceedance[b]	Frequency of detection[c]	Contaminant eliminated? (Yes/No)	Justification for elimination (step number)
Arsenic	7.2	7.4	0/3 (0%)	3/3 (100%)	Yes	1
Chromium	59	50	2/3 (67%)	3/3 (100%)	No	NA
Hexavalent Chromium	ND	—[d]	0/3 (0%)	0/3 (0%)	Yes	1
Lead	43.1	23	2/3 67%)	3/3 (100%)	No	NA
Mercury	0.4	0.074	1/3 (33%)	3/3 (100%)	No	NA

a. Obtained from Rood et al. (1995).
b. Expressed as the number of detections above background/total number of samples analyzed and as a percent.
c. Expressed as the number of detections/total numbers of samples analyzed and as a percent.
d. No background concentration is available. Therefore, any detection is considered to exceed background.
NA Not applicable.
ND Non detect.

Table 3-19. Wastewater discharge history to Industrial Waste Pond.

Year	Volume discharged (million gal)	Year	Volume discharged (million gal)
1961	24	1978	24
1962	24	1979	22.37
1963	24	1980	45.23
1964	24	1981	52.47
1965	24	1982	33.27
1966	24	1983	35.18
1967	24	1984	42.74
1968	24	1985	51.62
1969	24	1986	40.36
1970	24	1987	53.97
1971	24	1988	47.67
1972	24	1989	23.12
1973	24	1990	50.88
1974	24	1991	40.14
1975	24	1992	no data
1976	24	1993	20.70
1977	31	1994	20.10
	Total		1,018.82
	Average rate		30.87

A natural, intermittent form of surface water that does exist at ANL-W is runoff from precipitation. Runoff from the main parking lot at ANL-W drains via the Interceptor Canal (ANL-09) to the Industrial Waste Pond. Usually, all runoff from precipitation infiltrates in the Interceptor Canal before reaching the Industrial Waste Pond. But, under unusual conditions, surface runoff along this Interceptor Canal has reached the IWP. This occurs when the air temperature has been warm enough to cause rapid snowmelt, and the ground has remained frozen precluding infiltration.

Runoff that reaches the Main Cooling Tower Blowdown Ditch (MCTBD) (ANL-01A), ANL-01 ditches (A and C), the North Ditch, and the Interceptor Canal (ANL-09) has the potential to serve as an additional driving force for contaminants in these retained sites. As a result of this potential impact to the quality of groundwater beneath ANL-W, it was necessary to prepare estimates of additional infiltration that occurs within these retained sites.

Runoff at ANL-W for a period of time and various precipitation events has been modeled by the HELP code (Hydrologic Evaluation of Landfill Performance, EPA 1994) and used as input to the groundwater exposure pathway transport predictive modeling. This resulted in an increase in the natural infiltration rates (conservative assumption) for all of the active ditches and canals at ANL-W, by providing an additional driving force for contaminant migration at ANL-09, ANL-35, ANL-01 ditches A and C, and the MCTBD. A thorough discussion of the estimated runoff is presented in the discussion of the groundwater transport methodology (Section 5.4).

Since no natural, permanent surface water bodies exist at ANL-W, surface water is not considered as a separate exposure pathway for the human health baseline risk assessment. Additionally, the effluent discharges are not required to meet any permit limits. The surface water in the Industrial Waste Pond is considered in the ecological risk assessment. Water samples collected from the North Ditch and the IWP are used to verify the process for approving surface effluent discharges . The results from the analysis of effluent samples collected in 1988 are presented in Table 3-20 for the North Ditch and Table 3-21 for the IWP.

The IWP samples containing detected quantities of contaminants include samples identified as 88010063 and IWPD HS. These were collected on September 26, 1988. The North Ditch samples with detected quantities of contaminants include samples identified as 88010062 and 88009952. These were collected on September 28, 1988. Tables 3-20 and 3-21 also include tap-water risk-based concentrations (RBC) or, where no risk-based concentrations are available, maximum contaminant levels (MCL), if established. Table 3-20 shows that the results for the organics acetone and methylene chloride, detected in samples collected from the North Ditch, are flagged with the data qualifier "B", indicating the same compounds were detected in blank samples. Likewise, Table 3-21 shows methylene chloride and bis(2-Ethylhexyl) phthalate sampled from the IWP were also detected in blank samples. However, these organics are retained since they were detected at levels greater than 10 times those detected in the blank samples.

The results of the surface water quality samples indicate that some discharges have contain contaminants that exceed the tap-water RBC or MCLs levels that indicate a human health impact. However, the surface water is not a viable exposure pathway for the human health risk assessment. Thus, these tap-water RBC and MCLs are only being used as a point of reference. Additionally, the groundwater pathway predictive model includes, as part of the input, inventories of contaminants of concern associated with soil contaminated surface features such as the ditches and pond that receive this surface liquid effluent.

However, Table 3-20 indicates none of the contaminants detected in the North ditch in 1988 exceeded the corresponding tap-water RBC or MCL. Table 3-21 shows detected concentrations of calcium, iron, magnesium, potassium, and sodium in the IWP water. These inorganic elements are considered essential elements to human health (EPA 1989) and are, therefore, not examined for risk. Also, Table 3-21 shows the maximum detected concentrations of the inorganics antimony, arsenic, beryllium, chromium, and manganese all exceeded their respective tap-water RBC concentrations in 1988. The inorganics iron, lead, and nitrate all exceeded their respective established MCLs. The 1988 radionuclide sampling results for Cs-137, gross alpha, and H-3 also include maximum detected concentrations in excess of the tap-water RBC for these isotopes. Also, the organic compound bis(2-ethylhexyl)phthalate exceeded the associated tap-water RBC for this compound.

Table 3-20. Surface water quality sampling results for North Ditch (ANL-35).

Type	Compound	Detects/ samples	Percent detects	Concentration range (ug/L)	Quality flag	RBC or MCL (ug/L)
Inorganic	Antimony	1/2	50%	3.7	B	15
	Copper	2/2	100%	28–29		1,100
	Zinc	1/2	50%	82		11,000
Radionuclides	(none detected)					
Organics	2,4-D	1/2	50%	4.5		61
	4-Methyl-2-Pentanone	2/2	100%	1-10	J	2,900
	Acetone	2/2	100%	4-5	JB	3,700
	Bromoform	1/2	50%	1	J	100[a]
	Methylene Chloride	2/2	100%	3	JB	11

B Indicates, for inorganics, that the reported value is less than the Contract Required Detection Limit (CRDL) but is greater that the Instrument Detection Limit (IDL).
J Indicates value is estimated.
JB Indicates the value is estimated and the analyte was found in associated blank as well as in sample.
a. MCL for bromoform.

The leaching of soil contamination as a contributor to the groundwater pathway currently does not include additional quantities based on discharge water concentrations. As Tables 3-20 and 3-21 show, the concentrations of contaminants in the water are orders of magnitude lower than those detected in the soils. However, knowing current discharge rates and assuming the sampled water concentrations are representative of the concentrations present in current discharges, the additional inventories of contaminants that have entered the subsurface since the ditch and ponds were sampled can be calculated. The analysis of the nature and extent of surface water contamination (Section 4.2) presents an examination of the potential additional soil contamination, due to continued liquid effluent discharges that have occurred since the soil was last sampled.

3.4 Perched Water Contaminant Screening

At the ANL-W, the subsurface geology is similar to that of the rest of the INEEL; yet, differences lie in the lack of continuous sedimentary interbeds beneath ANL-W. Sedimentary interbeds intercepted during drilling appear to be discontinuous stringers, deposited in low areas on basalt surfaces. The nature of these sedimentary interbeds and rubble zones does not appear to cause perching of infiltrating water to the degree observed elsewhere at INEEL, though they may retard the downward movement of water. In the subsurface beneath ANL-W, perched water appears only as small, localized zones of saturated conditions above some interbeds and within basalt fractures. A geohydrological investigation of the most

Table 3-21. Surface water quality sampling results for the Industrial Waste Pond (ANL-01).

Type	Compound	Detects/ samples	Percent detects	Concentration range (ug/L or pCi/L)	Quality flag	RBC or MCL[a] (ug/L or pCi/L)
Inorganic	Aluminum	6/10	60%	546–3,990		37,000
	Antimony	2/11	18%	5.2–50		15
	Arsenic	3/11	27%	4.4–10.1		0.047
	Barium	8/11	73%	71–148		2,600
	Beryllium	6/11	55%	3.4–4		0.02
	Cadmium	1/11	9%	2		18
	Calcium	8/10	80%	870–121,000		NS
	Chloride	6/6	100%	53,000–61,000		NS
	Chromium	6/11	55%	14–187		180
	Cobalt	1/11	9%	3		2,200
	Copper	3/11	27%	14–993		1,100
	Fluoride	6/6	100%	1,800–2,100		2,200
	Iron	8/10	80%	75–3,190		300[b]
	Lead	3/11	27%	2.9–358		15[b]
	Magnesium	8/10	80%	360–41,000		NS
	Manganese	7/10	70%	16–210		180
	Mercury	6/11	55%	0.03–0.04		3.7
	Nickel	3/11	27%	6–38		730
	Nitrate	5/6	83%	1,000–13,000		10,000
	0-phosphate-P	6/6	100%	5,500–7,200		NS
	Potassium	7/10	70%	14,200–21,000		NS
	Silver	1/11	9%	7		180
	Sodium	8/10	80%	430–101,000		NS
	Sulfate	6/9	67%	310,000–35,0000		500,000[b]
	TOC[c]	2/2	100%	5,100–5,300		NF
	TOX[c]	2/2	100%	17–230		NF
	Vanadium	7/11	64%	19–29		260
	Zinc	10/11	91%	11–785		11,000
Radionuclide	Co-60	3/6	50%	0.1–1.4		2.52
	Cs-137	3/9	33%	0.1–5.2		1.51
	Gross Alpha	6/18	33%	1–24		15

Type	Compound	Detects/ samples	Percent detects	Concentration range (ug/L or pCi/L)	Quality flag	RBC or MCL[a] (ug/L or pCi/L)
	Gross Beta	6/18	33%	0–60		NF
	Pu-239	7/12	58%	0.0001–0.008		62
	Sr-90	3/4	75%	2.9–41		0.85
	Th-228	12/12	100%	0–0.000006		0.21
	H-3	6/18	33%	4,317–4,709		666
Organics	2,4-D	1/3	33%	0.51		NF
	2-Butanone	1/6	17%	10		22,000
	Acetone	3/6	50%	5–150		3,700
	Di-n-butylphthalate	1/3	33%	2		3,700
	Dicamba	2/2	100%	0.25–0.272		1,100
	Methylene Chloride[f]	6/6	100%	1–6	B, J[f]	11
	OCDD	1/1	100%	1.14E–03		NS
	bis(2-Ethylhexyl) phthalate	2/3	67%	25–201	B	4.8

a. Presented in this column is the minimum of either the risk-based concentration (EPA 1995a) or the maximum contaminant level (EPA 1995b).
b. The listed value is the MCL (i.e., no toxicity data found)
c. TOC is total organic carbon; TOX is total organic halogens.
f. Of the six methylene chloride samples, J is the quality flag for three and B is the quality flag for six.
NS Indicates no standard established
NF Indicates no standard was found during preparation of report.
B Indicates the analyte was found in associated blank as well as in sample.
J Indicates value is estimated.

probable area for perched water to occur at ANL-W was conducted in 1988. Six boreholes around the Industrial Waste Pond were drilled in an effort to find perched water. Only one borehole produced any water and it quickly drained down the borehole and only wetted soil is present. Thus, the interbeds appear to be incapable of producing any significant amount of water. This is vastly different from the perched water conditions at other INEEL facilities such as the Idaho Chemical Processing Plant, which is the result of more continuous interbed layers and much higher pond discharge rates.

In defining perched aquifers, Fetter (1988) reports that, where a layer of low-permeability material is found as a lens in more permeable materials, water moving downward through the unsaturated zone will be intercepted by this layer and will accumulate on the top of this lens. If a layer of saturated soil forms above the main water table as a result of such a lens, the resulting saturated soil is termed a perched aquifer. Typically, water moves laterally over the low-permeability layer up to the edge of the lens and then seeps downward toward the main water table or discharges via a natural spring.

Perched aquifers are common in glacial outwash, where lenses of clay formed in small glacial ponds are present. They are also often present in volcanic terrains, such as the Snake River Plain, where weathered ash zones of low permeability can occur sandwiched between high-permeability basalt layers. Perched aquifers are usually not very large. Most would only supply enough water for household use (Fetter 1988). According to previous investigations at ANL-W, the perched water bodies that have been detected at ANL-W are generally incapable of producing even enough water to provide a sample for perched water quality analysis (ANL-W 1996).

Only limited information is currently available on vadose water quality. Sampling done during characterization work on the IWP in 1987 was the only time enough water could be collected from the vadose zone for analysis. Shallow well M-5, located near the southwest edge of the IWP, was the only vadose zone well to provide sufficient water for sampling during this time (ANL-W 1996). The well was bailed at a rate of approximately 0.5 gpm. Since that time other attempts to collect a sample have been unsuccessful since the well only occasionally retains trace quantities of water (less than six inches standing at well bottom). Results of the analysis are presented in Table 3-22.

Water from the IWP and the sampled vadose zone water can be differentiated from water derived from the SRPA, in the ANL-W area. Pond water and vadose water are a mixed cationic (calcium-sodium sulfate) type, whereas groundwater from the SRPA is characterized as a single cationic, calcium bicarbonate type (Chen-Northern, Inc. 1989). The similarity in cation percentages between the pond water and the vadose water strongly suggests that the vadose water was derived from downward seepage of pond water.

Table 3-22 indicates the inorganic elements, aluminum, antimony, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, vanadium, and zinc, and the inorganic compounds, cyanide and sulfide, were all analyzed for but not detected during the 1987 sampling event. Although Table 3-22 indicates the sampled vadose zone water contained detected concentrations of calcium, iron, magnesium, potassium, and sodium in 1987, these elements are considered essential nutrients to human health, and as such, are not considered as contaminants of potential concern (EPA 1989).

Barium was detected but at a concentration (83 ug/L) much less its corresponding MCL (2,000 ug/L) and RBC (260 ug/L). No MCL, RBC, or toxicity data for developing a RBC were found for the parameters total organic carbon (TOC) and total organic halides (TOH). No specific organic compounds were analyzed for. Only the inorganics arsenic and manganese were detected at concentrations (10.1 and 210 ug/L, respectively) that exceeded their corresponding RBCs of 0.047 and 18 ug/L, respectively. These two elements have the same established MCL of 50 ug/L; though the manganese concentration exceeds this, arsenic does not. This is not surprising since in Table 3-21, these compounds were also detected at significant concentrations in the sampled IWP water.

Similar to the discussion of surface water in the IWP and North ditch, it is important to note that, in this analysis, any contaminants in the vadose zone water, whether perched temporarily on impermeable layers or simply migrating downward unimpeded to the aquifer, are not considered a separate risk exposure pathway but only as a potential risk through the groundwater pathway. Though it is possible to mine perched water for drinking or bathing purposes, the perched water at ANL-W is very limited both spatially and temporally and not of sufficient quantity to provide sustained residential use. Also, as the data shows the water that was encountered in the well near the IWP was a mixture of the groundwater (cationic, calcium bicarbonate) and ANL-W process water (sodium sulfate).

Table 3-22. Vadose zone water quality results

Type	Compound/parameter	Concentration (ug/L)	Maximum contaminant level (ug/L)	Risk-based concentration[a] (ug/L)
Inorganics	Aluminum	125 U	200	3,700
	Antimony	28 U	6	1.5
	Arsenic	10.1	50	4.7E–02[b]
	Barium	83	2,000	260
	Beryllium	5 U	4	2.0E–03
	Cadmium	5 U	5	1.8
	Calcium	9.86E+4	NS	ND
	Chromium	10 U	100	18[c]
	Cobalt	20 U	NS	220
	Copper	20 U	1,000	150
	Iron	75	300	1,100
	Lead	2.1 U	15	ND
	Magnesium	3.04E+4	NS	ND
	Manganese	210	50	18
	Mercury	20 U	2	1.1
	Nickel	24 U	100	73
	Potassium	1.5E+4	NS	ND
	Selenium	2 U	50	18
	Silver	2 U	100	18
	Sodium	7.43E+4	NS	ND
	Thallium	2.2 U	2	ND
	Vanadium	20 U	NS	ND
	Zinc	20 U	5,000	11,000
	Cyanide	5 U	200	730
	Sulfide	1,000 U	NS	ND
Organics	Total Organic Carbon	5,100	NS	ND
	Total Organic Halogens	17	NS	ND

a. The values in this column are screening level concentrations based for noncarcinogenic contaminants based on a hazard quotient of 0.1.
b. The carcinogenic risk-based concentration (based on 1E-6 risk) is presented here for arsenic.
c. Value is for hexavalent chromium (Cr-VI).
NS Indicates no MCL standard exists for this compound.
ND Indicates no toxicity data exist.
U Is a data qualifier that indicates the compound was sampled for but not detected. The value listed is the instrument detection limit.

It is anticipated that, when operations at ANL-W permanently cease, any perched water beneath ANL-W will also cease to exist. This is based on the fact that the man made activities release millions of gallons of water to the Industrial Waste Pond and the hydrogeologic investigation around this pond has not located any perched water from the boreholes. As a result, there will be no source for perched water risk pathway for future residents. In the meantime, the vadose zone is not a current nor projected source of production or consumption water at ANL-W; therefore, contaminated perched water is not a separate risk pathway for the occupational scenario either. Further discussion of the potential impacts to the groundwater pathway that may result from contaminated perched water is presented in the perched water contamination nature and extent section of this report (Section 4.3).

3.5 Groundwater Data Evaluation and Contaminant Screening

Groundwater samples collected from aquifer monitoring and production wells at ANL-W were analyzed for volatile organic and inorganic compounds, and radionuclides. Three wells (EBR-II #1, EBR-II #2, M-11) were been sampled quarterly in 1994, and wells M-12 and M-13 were sampled quarterly in 1995. The relative locations of these wells are shown in Figure 3-3. The sample identification numbers and dates sampled are summarized in Table 1 of Appendix J. Samples were analyzed for the full list of 40 CFR 264, Appendix IX constituents and also INEEL-specific parameters. The complete list of Appendix IX and INEEL-specific constituents are presented as Table 2 of Appendix J. The validated sample results from all three data sets can also be found in the Appendix J. The range of sample dates for this data is from April 12, 1994 to October 25, 1995.

The validated data were evaluated based on the qualifiers and codes attached to the data. Chemicals were eliminated from the contaminants of concern list or left for further screening, as appropriate. Table 3 of Appendix J lists the organic, inorganic, and radiological compounds and parameters for which data qualifiers flags "U" or "R" indicated the data were not detected or rejected, respectively, and are deemed not appropriate for inclusion in this analysis. This included the majority of records (3,011 organic, 308 inorganic, and 178 radiological) which eliminated 208 organic compounds, 4 inorganic compounds, and 8 radionuclides from further analysis. These are summarized in Table 4 of Appendix J. Additionally, the set of inorganic sample results includes 11 parameters or indicator compounds (alkalinity, bic alkaline, carbonate, conductivity, pH, specific conductance, TDS, TOC, and TOX) that are not considered as potential contaminants of concern. Tables 3-23, 3-24, and 3-25 present the detected contaminants, their frequency of detection, and range of concentrations for organic and inorganic compounds, and radionuclides, respectively.

Blank samples provide a measure of contamination that has been introduced into a sample set either in the field while the samples were being collected, during transport to the laboratory, or in the laboratory during sample preparation or analysis. To prevent the inclusion of nonsite-related contaminants in the risk assessment, concentrations of chemicals detected in blanks should be compared with the concentration of the same chemicals detected in site samples during the same sampling round. Common laboratory contaminants were eliminated from the COC list if the sample concentrations of the identified common laboratory contaminant did not exceed 10 times the blank concentration (EPA 1989, 1991). However, none of the maximum detected concentration results for the organic compounds were flagged with the "B" qualifier; therefore, this type of analysis was not required.

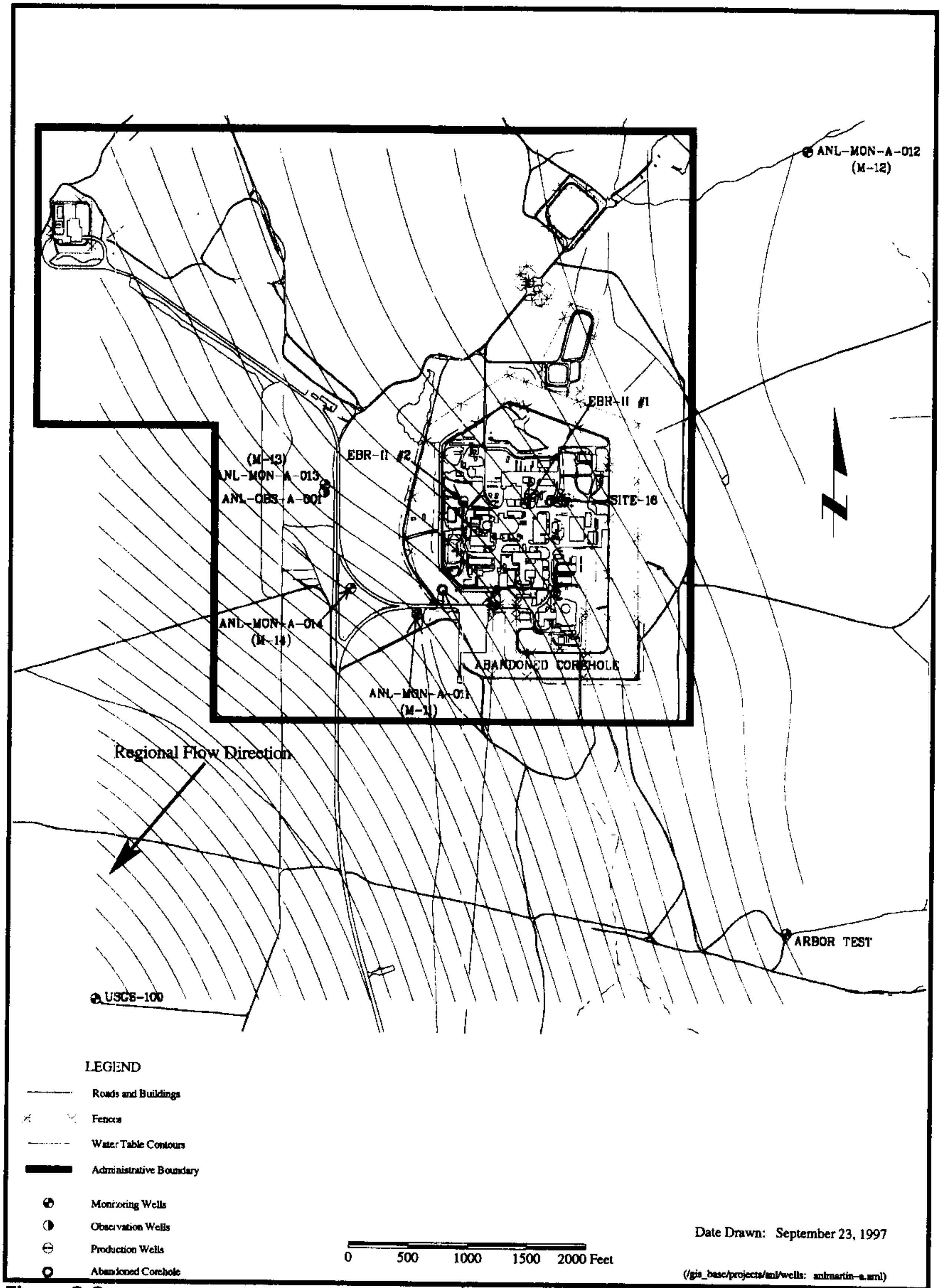

Figure 3-3. Locations of Wells in the ANL–W Area.

Inorganics that are considered common essential nutrients and are not associated with toxicity to humans are also eliminated from the contaminant of concern list (EPA 1989). These elements include calcium, iron, magnesium, potassium, and sodium. These five elements can generally be eliminated from the human health risk assessment at the screening stage based on qualitative judgment (EPA 1991). Arsenic, a potential carcinogen, is also considered an essential nutrient at low concentrations (EPA 1989). Background concentrations for arsenic are reported as 1 to 4 ug/L (Knobel et al. 1992). Maximum concentrations detected in the most recent rounds of groundwater sampling range near 4 ug/L or less. However, the preparation of the groundwater pathway modeling for transport of soil contamination indicated early on that arsenic is a risk driver for that pathway. As a result, this contaminant was maintained in the list of groundwater contaminants of concern based on groundwater sampling.

A further screening of the data was made based on the health risk of the chemical (EPA 1991). If no single sample exceeded a concentration representing a human health risk concern, the assumption was made that the total exposure to the contaminant from the site was not of concern. This risk-based screening of contaminants compares the maximum sample concentration of each contaminant detected at the site to a risk-based concentration. The risk-based concentration is calculated using a conservative target risk of 1×10^{-6} and standard default factors for residential exposure through ingestion of water and inhalation of volatiles while showering (EPA 1991).

Tables of screening-level risk-based concentrations for tap water and other media were downloaded from the EPA risk homepage on the internet (http://www.epa.gov/reg3hwmd/risk). These contain up-to-date risk-based concentrations and the most complete set of chemicals for which data are available. In addition, HEAST tables (EPA 1993) were consulted to prepare risk-based concentrations from carcinogenic slope factors for radionuclides.

Carcinogenic chemicals with a maximum sample concentration below the acceptable risk of 1×10^{-6} were eliminated from the COC list. A hazard quotient of 0.10 is used for a noncarcinogenic screening value for chemicals because multiple pathways and multiple contaminants may result in cumulative effects (EPA 1991). Noncarcinogenic chemicals with a maximum sample concentration equal to or less than the concentration that results in a hazard quotient of 0.10 were eliminated from the potential contaminants of concern list. Table 3-26 lists the contaminant's maximum detected concentration, corresponding risk-based or hazard-based concentration, and results of this portion of the screening process for the organic data set. Tables 3-27 and 3-28 present the risk-based concentration screening process for and radionuclides and inorganics, respectively.

Table 3-23. Organic compounds detected in groundwater at ANL-W.

Detected contaminant	Frequency of detection	Range of detected concentrations (ug/L)
Acetone	2/17	9–12
bis(2-Ethylhexyl)phthalate	10/14	5–370
Carbon Disulfide	1/17	1
Di-n-butylphthalate	3/14	1
Dimethoate	3/14	0.24–0.53
Endosulfan I	1/14	0.1
Endosulfan II	2/14	0.25–0.5

Table 3-24. Inorganic compounds detected in groundwater at ANL-W.

Compound	Frequency of detection	Range of detected concentrations (ug/L)
Antimony	2/17	27.4–105
Arsenic	9/17	1.7–3.8
Barium	16/17	34.6–58.7
Cadmium	2/17	2.9–6.2
Chromium	5/17	3.6–15.5
Cobalt	1/17	3.2
Copper	9/17	2.2–16.3
Lead	9/17	1.1–10.3
Manganese	1/12	5.5
Mercury	1/17	0.17
Nitrate	9/9	1,400–7,340
Selenium	1/17	3.2
Silver	1/17	3.5
Tin	1/17	2,640
Vanadium	12/17	5.7–20.7
Zinc	12/17	8–164

Table 3-25. Radionuclides detected in groundwater at ANL-W.

Radionuclide	Frequency of detection	Lowest concentration detected (pCi/L)	Highest concentration detected (pCi/L)
Gross alpha	9/16	0.5-13	13
Am-241	4/9	0.15+/-0.05	0.53 +/– 0.1
Gross beta	16/16	2.5+/-1.1	6,070 +/– 50
I-129	2/8	0+/-0.3	0.6 +/- 0.3
Np-237	8/9	0+/-0.1	7.1 +/– 0.6
Pu-238	2/9	0+/-0.06	0.6 +/- 0.5
Pu-239/240	2/9	0+/-0.04	0.04 +/– 0.03
Sr-90	4/9	0.1+/-0.3	1,330 +/– 6
Tc-99	5/16	0.1+/-0.4	1.9 +/– 0.5
Tritium	2/15	0+/-147	187 +/– 153
U-234	8/9	0.7+/-0.3	1.5 +/– 0.6
U-235	2/9	0+/-0.1	0 +/– 0.09
U-238	5/9	0.4+/-0.2	1.9 +/– 0.4

For the organic compounds data set, the known laboratory contaminant and carcinogen, bis(2-Ethylhexyl)phthalate, was detected at a maximum concentration of 370 ug/L which significantly exceeds the 1E-6 risk-based tap water concentration of 4.8 ug/L. Table 3-21 indicates the compound was also detected in surface water of the IWP, though the associated blank for that sampled also contained the compound. Still, it is retained for further analysis in the BRA. All other organics (acetone, carbon disulfide, di-n-butylphthalate, dimethoate, endosulfan I, and endosulfan II) were screened from further analysis based on risk-based concentrations (RBCs).

For the inorganic compounds data set, potential contaminants of concern identified consist mostly of noncarcinogens (antimony, arsenic, cadmium, nitrate, and tin). But, arsenic has a carcinogenic effect as well, and is being retained at this point based on the noncarcinogenic screening criterion. Antimony, arsenic, and cadmium were all detected in both the IWP surface water and the sludge at the bottom of the EBR-II Leach Pit (ANL-08) (see Section 5.4). Nitrate was also detected in the IWP surface water. Tin, however, was not analyzed for in either the surface water or Leach Pit sludge samples.

Lead was deleted from the contaminant of concern list because there are no toxicity data available for this inorganic. The regulatory drinking water maximum contaminant level (MCL) for lead is 15 ug/L. The maximum detected concentration of lead (10.3 ug/L) in all wells during the most recent rounds of sampling were below this level. Other inorganics screened at this step include barium, chromium, cobalt, copper, manganese, mercury, selenium, silver, vanadium, and zinc.

Table 3-26. Screening of organic compounds detected in groundwater at ANL-W.

Compound	Maximum detected concentration (ug/L)	Data quality flag	Risk-based concentration (ug/L)	MCL (ug/L)	Background (ug/L)	Screen Yes/No?
Acetone	1.20E+01	J	3.7E+02	NS	ND	Yes
bis(2-Ethylhexyl)phthalate	3.70E+02		4.8E+00	NS	ND	No
Carbon Disulfide	1.0E+00	J	1.0E+02	NS	ND	Yes
Di-n-butylphthalate	1.0E+00	J	3.7E+02	NS	ND	Yes
Dimethoate	5.3E−01	J	7.3E−01	NS	ND	Yes
Endosulfan I	1.0E−01	J	2.2E+01	NS	ND	Yes
Endosulfan II	5.0E−01		2.2E+01	NS	ND	Yes

J Indicates estimated numerical value.
NS Not stated.
ND Not detected.

The set of 13 detected radionuclides contain five isotopes (Am-241, Np-237, Sr-90, U-234, and U-238) which fail the RBC screening step. These contaminants were all detected in the sludge removed from the bottom of the EBR-II Leach Pit. Though the uranium and transuranic isotopes listed here were not analyzed for in the IWP surface water, gross alpha measurements were made and indicate the possible presence of the isotopes in the IWP (see Table 3-21). Sr-90, a beta emitter, was detected at a maximum concentration (1,330 pCi/L) that greatly exceeds the tap water RBC for this isotope (0.85 pCi/L). Sr-90 was detected in the IWP surface water. H-3, I-129, Pu-238, Pu-239/240, Tc-99, and U-235 were eliminated at this point from further consideration in the BRA based on comparisons of maximum groundwater concentrations with corresponding RBCs.

Table 3-27. Screening of radionuclides detected in groundwater at ANL-W.

Compound	Maximum detected concentration (pCi/L)	Uncertainty (pCi/L)	Data quality flag	Risk-based concentration (pCi/L)	MCL (pCi/L)	Background (pCi/L)	Screen Yes/No?
ALPHA	13	4		NS	1.50E+01	ND	Yes
Am-241	0.53	0.1		1.5E−01	6.34E+00	ND	No
BETA	6,070	50		NS	4 mrem	ND	Yes
I-129	0	0.3		2.6E−01	2.10E+01	ND	Yes
Np-237	7.1	0.6		2.2E−01	NS	ND	No
Pu-238	0	0.06		1.6E−01	7.02E+00	ND	Yes
Pu-239/240	0.04	0.03		1.5E−01	6.21E+01	ND	Yes
Sr-90	1,330	6	J	8.5E−01	8.00E+00	9.00E-02	No
Tc-99	1.9	0.5		3.4E+01	3.79E+03	ND	Yes
Tritium	187	153		6.7E+02	2.00E+04	4.00E+01	Yes
U-234	1.5	0.4		1.0E+00	1.39E+01	ND	No
U-235	0	0.1		1.0E+00	1.45E+01	ND	Yes
U-238	1.9	0.4		7.9E−01	1.46E+01	ND	No

J Indicates estimated value.
NS Not stated.
ND Not detected.

Table 3-29 lists the groundwater contaminants of concern that are retained for further analysis in the BRA. The table includes where and when the maximum concentration was detected for each contaminant. This list includes one organic (bis(2-Ethylhexyl)phthalate), five inorganics (antimony, arsenic, cadmium, nitrates, and tin), and five radionuclides (Am-241, Np-237, Sr-90, U-234, and U-238). It should be noted that the maximum detected concentrations reported here in many cases are extreme outliers of the entire set of detected concentration results for a given contaminant. For example, Sr-90 is retained here based on a maximum concentration of 1,330 pCi/L; however, the other three detected concentrations returned with the sampling results are orders of magnitude less than this maximum.

It is important also to note that the maximum detections of the organic compound [bis(2-ethylhexyl) phthalate], cadmium, and the isotopes Am-241, Np-237, U-234, and U-238 were detected in the upgradient monitoring well M-12. In the nature and extent of groundwater contamination (Section 4.4), water level contour plots are presented which indicate the general direction of flow of groundwater. The

Table 3-28. Screening of inorganic compounds detected in groundwater at ANL-W.

Compound	Maximum detected concentration (ug/L)	Data quality flag	Risk-based concentration (ug/L)	MCL (ug/L)	Background (ug/L)	Screen Yes/No?
Antimony	1.05E+02	—	1.5E+00	NS	ND	No
Arsenic[a]	3.80E+00	B, W	1.1E+00	NS	2.00E+00	No
Barium	5.87E+01	—	2.6E+02	NS	5.00E+01	Yes
Cadmium	6.20E+00	—	1.8E+00	NS	1.00E+00	No
Chromium	1.55E+01	—	1.8E+01	NS	ND	Yes
Cobalt	3.20E+00	—	2.2E+02	NS	ND	Yes
Copper	1.63E+01	N	1.5E+02	NS	ND	Yes
Lead	1.03E+01	N	NC	1.50E+01	5.00E+00	Yes
Manganese	5.50E+00	—	1.8E+02	NS	ND	Yes
Mercury	1.70E−01	—	1.1E+00	NS	1.00E−01	Yes
Nitrate	7.34E+03	J	5.8E+03	NS	1.40E+03	No
Selenium	3.20E+00	—	1.8E+01	NS	1.00E+00	Yes
Silver	3.50E+00	—	1.8E+01	NS	1.00E+00	Yes
Tin	2.64E+03	P	2.2E+03	NS	ND	No
Vanadium	2.07E+01	—	2.6E+01	NS	ND	Yes
Zinc	1.64E+02	N, J	1.1E+03	NS	ND	Yes

a. EPA risk-based concentration tables (EPA 1995a) list arsenic with carcinogenic risk-based concentration of 4.50E−02 ug/L which this detected maximum groundwater concentration would also fail.
B Indicates reported value is < CRDL but > IDL.
W Problems occurred with spiked sample furnace analysis.
N Indicates spiked sample recovery not within control limits.
J Indicates value is estimated.
P Indicates problem with gas chromatography analysis.
NC Lead is not listed in EPA RBC tables (EPA 1995a); however, an MCL of 0.015 mg/L is listed in the INEL Track 2 guidance EPA water "cheat sheets" (DOE 1992).
NS Not stated.
ND Non Detected

section discusses how monitoring well M-12 is located outside of the administrative boundary of ANL-W and, with regards to the general direction of groundwater flow in the vicinity of ANL-W, is upgradient of the site. Therefore, it is not likely these contaminants are of ANL-W origin. Antimony, nitrate, tin, and Sr-90 maximum concentrations from this data set were detected in monitoring well M-13, which is within the site's administrative boundary and downgradient of process buildings and discharge locations at the site. Arsenic, the remaining retained contaminant, was detected in the ANL-W groundwater production well EBR-II #2.

Table 3-29. Contaminants of concern detected in groundwater at ANL-W.

Type	Compound	Maximum detected concentration	Units	Sampled well	Date of sample	Location of well relative to ANL-W
Organics	bis(2-Ethylhexyl) phthalate	370	ug/L	M-12	18-May-94	upgradient
Inorganics	Antimony	105	ug/L	M-13	25-Oct-95	downgradient
	Arsenic	3.8	ug/L	EBR-II #2	19-May-94	central
	Cadmium	6.2	ug/L	M-12	12-Apr-94	upgradient
	Nitrates	7,340	ug/L	M-13	25-Oct-95	downgradient
	Tin	2,640	ug/L	M-13	25-Oct-95	downgradient
Radionuclides	Am-241	0.53 +/- 0.1	pCi/L	M-12	31-Jul-95	upgradient
	Np-237	7.1 +/- 0.6	pCi/L	M-12	20-Mar-95	upgradient
	Sr-90	1330 +/- 6	pCi/L	M-13	25-Oct-95	downgradient
	U-234	1.5 +/- 0.4	pCi/L	M-12	20-Mar-95	upgradient
	U-238	1.9 +/- 0.4	pCi/L	M-12	25-Oct-95	upgradient

A more complete discussion of the spatial and temporal nature and extent of groundwater contamination within and near ANL-W is presented in the nature and extent of groundwater contamination section of this report (Section 4.4). The discussion of extent of this groundwater contamination is based on the entire set of sampling results for each of these contaminants of concern, as well as trends based on historical data, and includes discussion of available background concentrations.

3.6 References

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